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PAVING, SEWERAGE, WATERWORKS,
STREET LIGHTING, PARKS, STREET CLEANING,
GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

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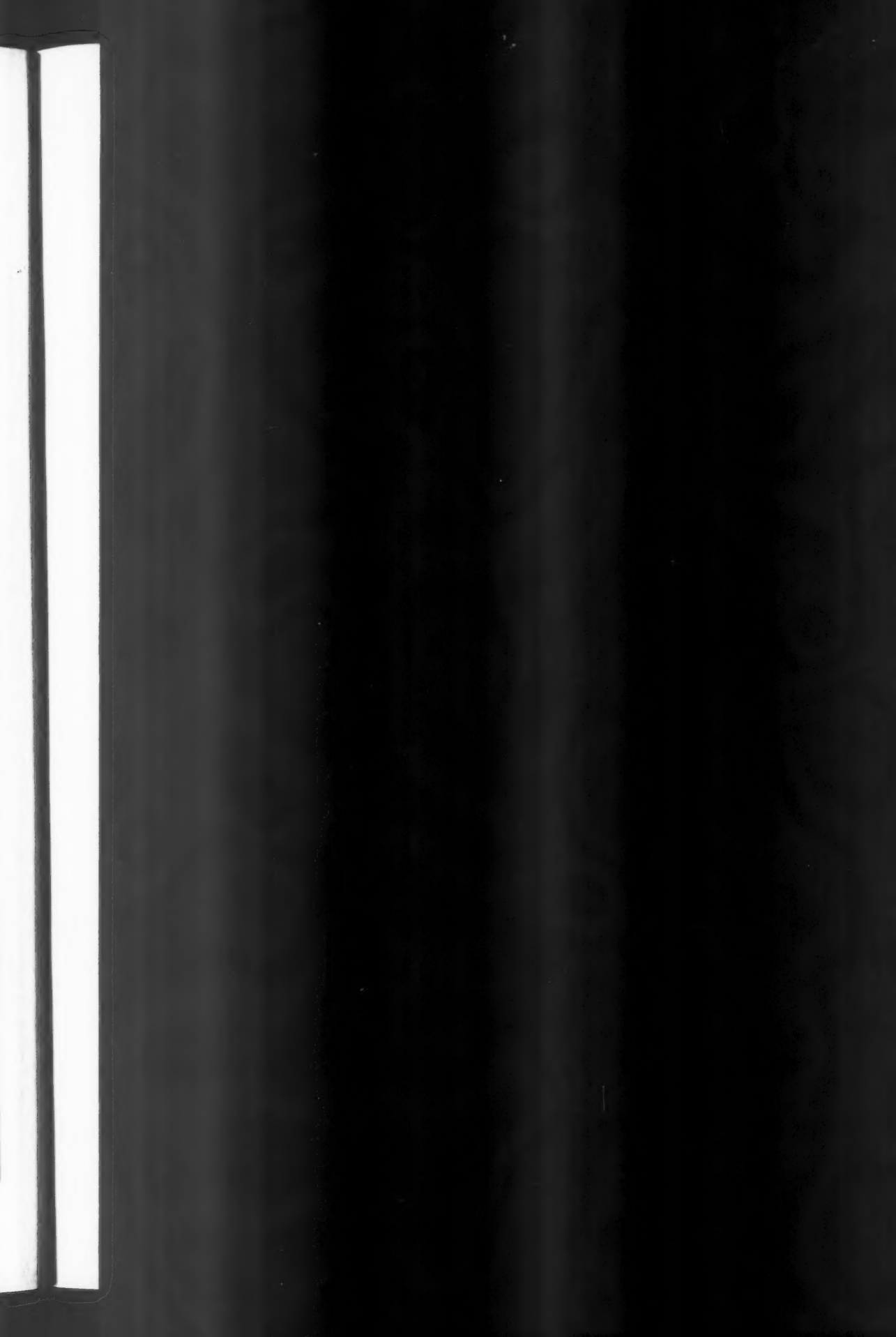
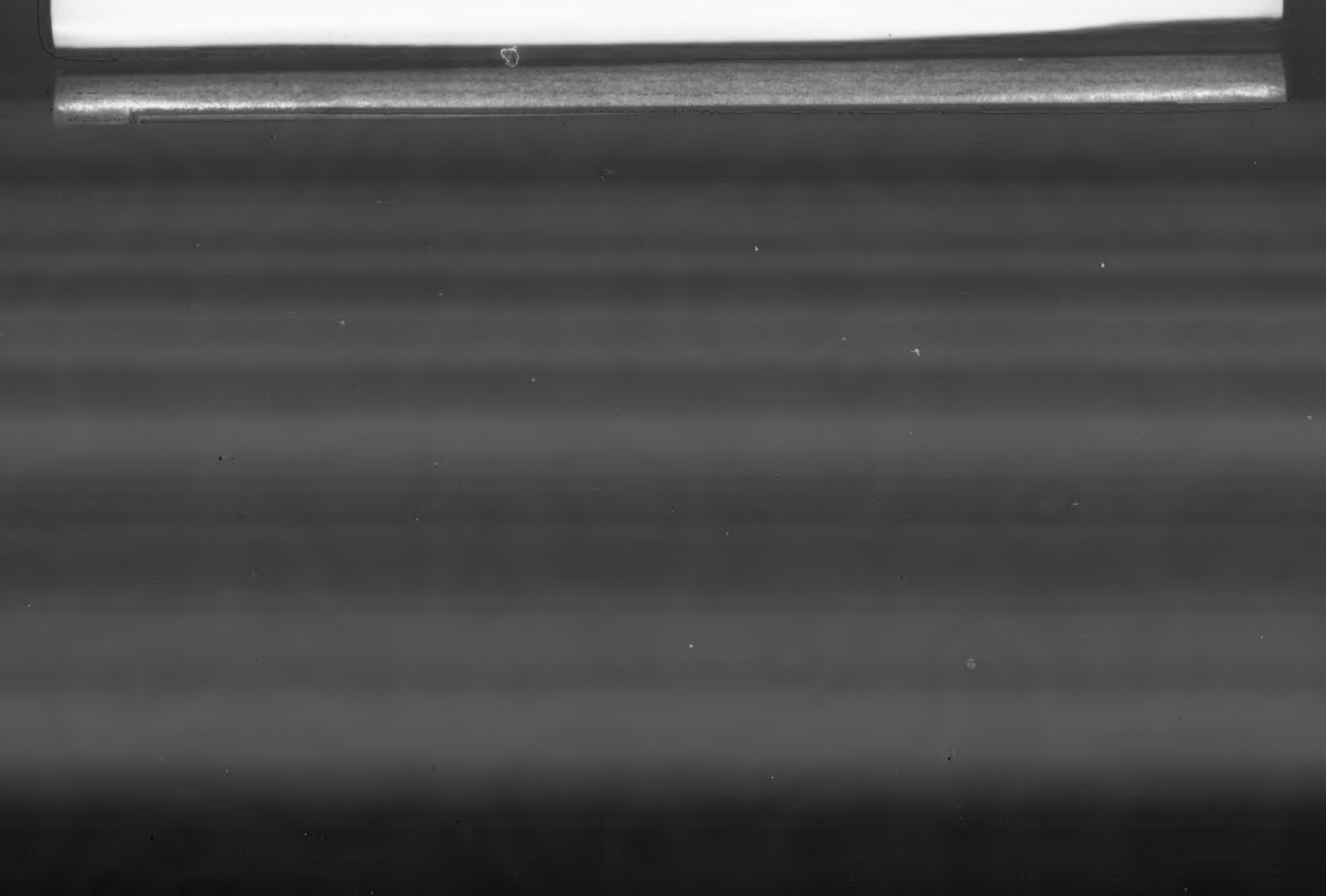




MUNICIPAL ENGINEERING

VOLUME XXIX. AUGUST, NINETEEN HUNDRED FIVE. NUMBER TWO

HOW TO LAY GRANITOID CURB AND GUTTER.

By J. C. Herring, City Engineer, Jefferson City, Mo.

Construction. Granitoid curb and gutter is constructed in the same general manner and of the same materials as sidewalk. The top and face of the curb and the top of the gutter are formed from templets which are usually of wood for alternate work and of steel plates for continuous work. Care must be taken that the templets are placed at right angles to the line and grade. that they are not warped or bent, and that they are uniformly of the required width. Imperfect templets should be condemned and removed from the work. A two-inch plank should be clamped to the face of the curb templet to form a receptacle for the concrete and hold the curb in place until it hardens sufficiently to become self supporting. This plank should be plastered to the proper thickness, say one inch, with stiff top stuff or facing before the concrete is put in. If the facing will not stick to the board, put some concrete in, and with a trowel push it back from the board until there is space enough left for the facing. Plenty of facing should be put in or else the concrete, when properly tamped, will push through and show on the face of the curb. The concrete should be well tamped, and if the curb is more than six inches deep it should be tamped in two or more layers. When the curb is stiff enough to hold its form the plank is taken off and the stone cut to its proper shape with an iron-shod straight-edge (be sure the edge is straight). It is then floated carefully and troweled smooth. If the plank is taken off too soon the curb will be weak and will settle out of shape while it is being troweled. This is a common defect and should be carefully guarded against. Concave and convex curve tools are usually used to finish the upper and lower curves on the face of the curb. These curves are usually of one inch radius. If the curves on the templets are not cut true to the radius there will be trouble in using the curve tools and the finishing will have to be done carefully with the trowel.

Excepting the templets, tamper, curve tools, clamps, gauge and float, the same tools are used as in sidewalk work.

The requirements for good work are:

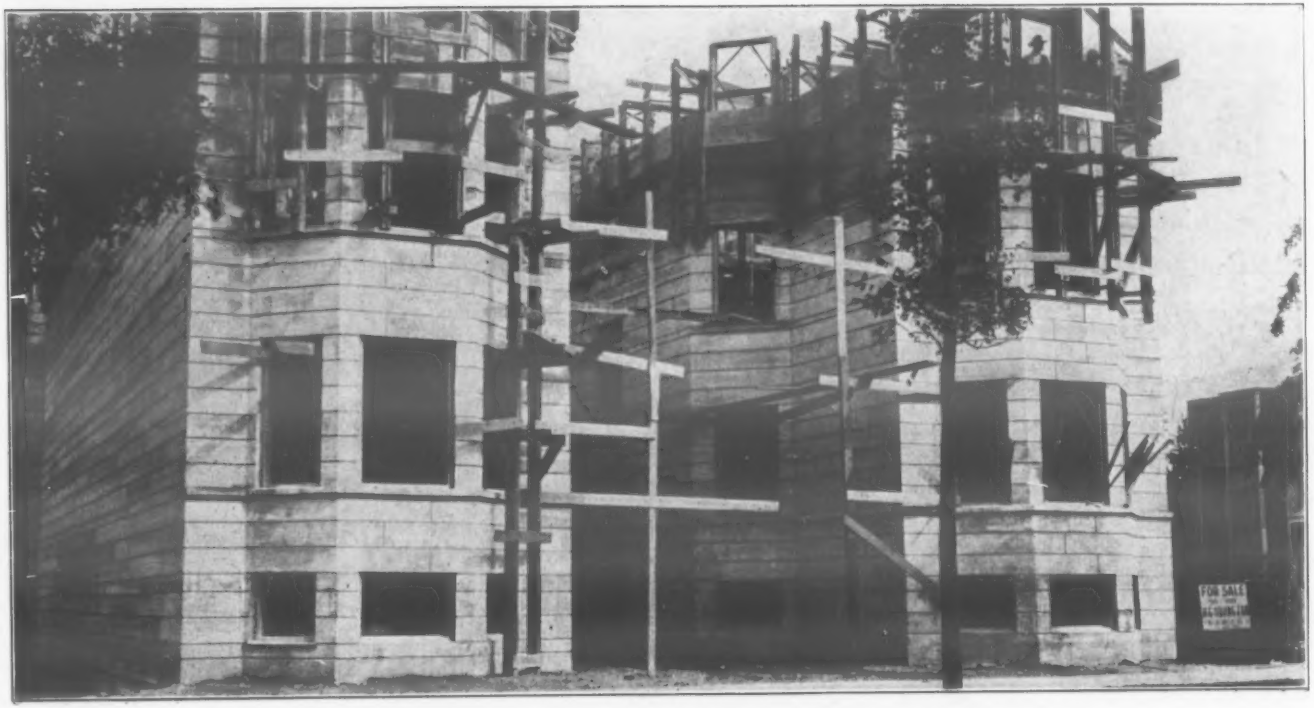
1. True alignment of face and curb.
2. True grade for top of curb and gutter.
3. Neat straight face, joints and edges and true curves.
4. Joints perpendicular to line and grade.
5. Good finish.
6. Proper thickness of facing.
7. Good material, combined in the proper proportions, and well tamped.

In order to secure work that will be up to these requirements, even approximately, it will be necessary for the engineer or a competent inspector to be present when the work is being done and to diligently inspect each part of the work during its construction. Where a large gang is at work two inspectors may be required, who may divide up the work about as follows:

The chief inspector will follow the form-setters, inspecting the forms and checking the lines, grades and templet angles; at the rear he will look after the details of the work, from the concrete tamping to the finishing.

The assistant will look after the other details, which include putting in and tamping the cinders, inspecting the gravel, sand and cement; noting the number of batches of concrete and facing made, with quantities of material in each; seeing that the wetting and mixing of the concrete and facing is properly done; noting the amount of material on hand in the morning, the amount used during the day and the amount on hand at night; seeing that all condemned material is properly marked, and that it is speedily removed from the line of the work.

The engineer or inspector should be



1. MONOLITHIC CONCRETE APARTMENT HOUSE, CHICAGO, ILL.

provided with a 50-ft. steel tape, a pocket level, plumb-bob, try-square, two-ft. rule, a strong line or thread, and a note book.

He should measure the mixing boxes and keep accurate record of the number of cubic feet of gravel, sand and cement used in each batch of concrete and of facing.

The first page, at the beginning of each contract, should contain the general record, which may be as follows:

Kind of Material Used—
Cement (Iola Portland).
Gravel (Crushed Missouri Granite).
Sand (Kaw River).

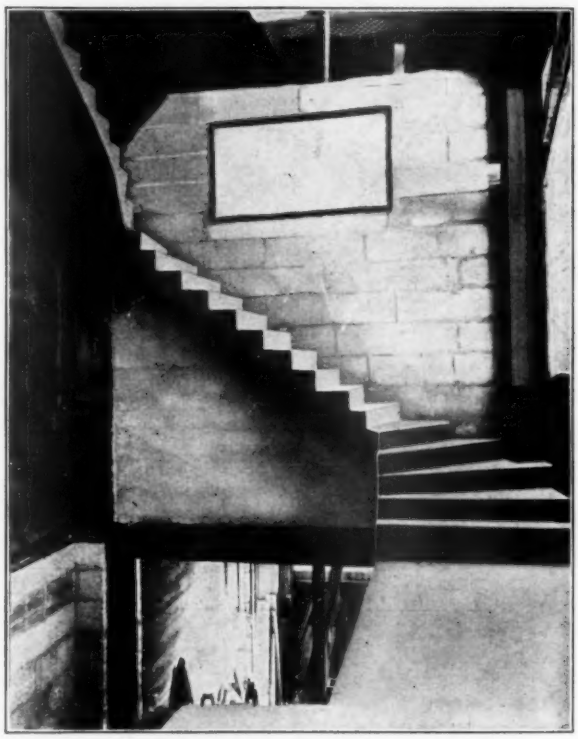
DAILY RECORD.

Date (May 5th, 1903).
Location (East side of Oak st., between 36th and 37th sts.).

GENERAL RECORD.

Date (of beginning work).
Class of work (granitoid curb and gutter).
Contractor (Smith and Jones).
Inspector (William Anderson).

Barrels of cement—
On hand (15).
Delivered (30).
Used (40).
Condemned (0).
Left over (5).



2. SELF-SUPPORTING CONCRETE STAIRWAY.

Cubic Feet in Batch of Concrete—
Cement (loose), 9 ft.
Gravel, 27 ft.
Sand, 4 ft.

Cubic Feet in Batch of Facing—
Cement (loose), 4 1-2 ft.
Sand, 4 1-2 ft.

Size of Stone—
Curb, 8 in. by 13 in. by 6 ft.
Gutter, 2 in. by 5 in. by 6 ft.
Together equal to 9 1-3 cu. ft.

The above items should be placed on the first page of record for each separate contract.

The following gives a form of daily record which may be used:

Granite—
On hand (18) yards.
Delivered (20) yards.
Used (10) yards.
Left over (28) yards.

Sand—
On hand (8) yards.
Delivered (6) yards.
Used (3 1-2) yards.
Left over (10 1-2) yards.
Linear ft. of stone made, straight (180) curved (24).
Batches of concrete made (10).
Batches of concrete used (10).
Batches of facing made (6 1-2).
Batches of facing used (6 1-2).

3. STEPS, CURB AND CARRIAGE BLOCK AT MARSHALL, ILL.

Labor—

Class.	Total No. of hours.
(2) Carpenters	(18)
(3) Finishers	(21)
(4) Concrete men	(36)
(2) Top men	(18)
(5) Laborers	(42)
(3) Teams	(24)

Weather clear, warm, dry. Stuff set well and finished nicely. Cow ran over 8th tangent stone south of 36th st. soon after it was finished. Repaired at contractor's risk.

WM. ANDERSON, Inspector.

SPECIFICATIONS FOR GRANITOID BUSINESS CURB.

The trenches for the reception of the curb shall be excavated to the exact depth and shape required by the plans.

Only hand excavation will be allowed within three inches of the bottom of the trenches.

Where the earth is removed below the proper depth, the contractor shall put in such foundation for the work as the engineer may require, without extra charge.

Where the natural foundation is not substantial, the excavation must be continued to such depth, and be refilled with such material as may be necessary to maintain the curb at its proper grade, and charge for such extra labor and material shall be included in the bid for this work.

Where the present foundation is not high enough it shall be brought to the

4. CONCRETE BASIN FOR FOUNTAIN AT ELGIN, ILL.

necessary height, and be well compacted without extra charge.

On this foundation, when properly prepared, the curb shall be constructed as follows:

The base shall be constructed of concrete, composed as follows: One part by volume of best Portland cement and three parts of crushed granite or trap rock, in sizes not to exceed three-fourths of an inch, and including enough fine screenings or sharp, clean river sand to fill all voids.

The ingredients for each batch shall be carefully and accurately measured, and the mixing must be done on platforms or in boxes. The stone and cement shall have two dry and two wet mixtures in such manner as the engineer may direct. This mass shall then be spread upon the foundation in layers of not to exceed six inches, and shall be tamped until all the interstices are thoroughly filled, and to the satisfaction of the engineer.

Within twenty minutes from the time the base or concrete is laid the finishing or wearing course must be added.

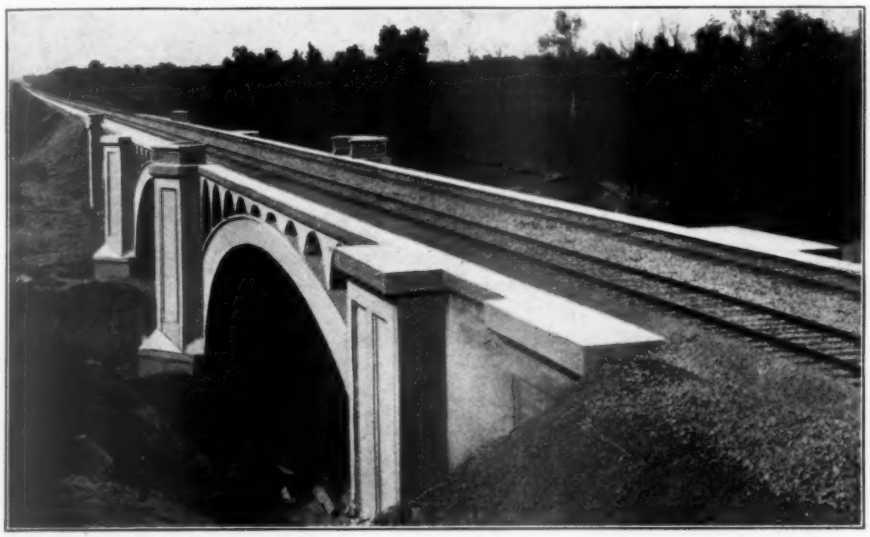
The finishing course shall consist of one part of best Portland cement and one part of granite screenings, or sharp, clean river sand, or both, as the engineer may require.

These shall be mixed to a stiff mortar and laid to a depth or thickness shown on the plans and cross-sections; the joints shall be smooth, straight, uniform and perfect in appearance, at right angles to the line of work, and must entirely separate the sections, so that when hardened any one of the sections of curb can be removed without injury to itself or adjoining stones.

All exposed surfaces must be troweled to form a smooth and even finish. The ends, where exposed, must be plastered with mortar, such as is used in the wearing surface.

Expansion joints, to be filled with refined bitumen, shall be placed at such points as the engineer may direct.

During dry weather the stones shall be kept damp by a covering of moist sand or otherwise, for a period of ten days after completion, or to the satisfaction of the engineer.



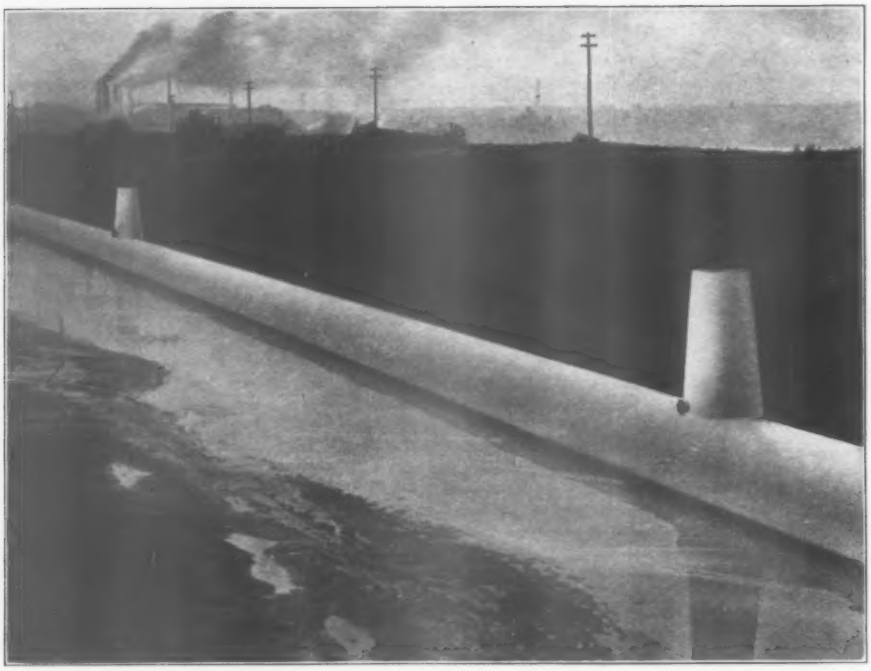
5. CONCRETE BRIDGE OVER BIG MUDDY RIVER, ILLINOIS CENTRAL RAILROAD.

The dimensions of the stones shall conform to the plans and cross-sections hereto attached, and the length of each section shall be five feet, except in such special cases as the engineer may approve.

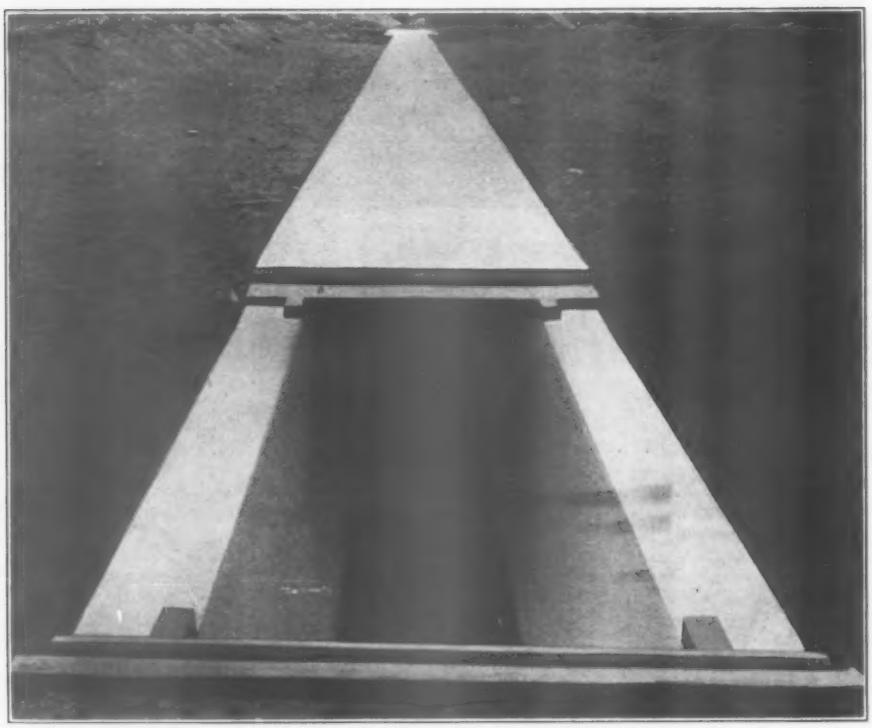
Any spalling or splitting off whatever of the finished surface of the work, either at the joints or in the body of the stone, or any cracks or map cracks or defective work of any character, will be sufficient cause for rejection, and any rejected stone must be removed and replaced with a new stone immediately.

The contractor must protect the work during the construction and until the surface is ready for use, from the elements or damage from any cause.

The contractor shall guarantee that said curb shall be of such perfect material and workmanship as to endure for a



6. CONCRETE SEWER AT MOLINE, ILL.
Filling partly completed on one side.



7. CONCRETE SUBWAY AT MOLINE, ILL.

period of —— years after the completion and acceptance of said work without showing settlement, cracks, discoloration or any other defects, and said contractor shall, during the time of said guarantee, remove such stone as may show any defects and substitute new work therefor when called upon to do so by the mayor or city engineer, and shall complete such work of replacing defective stones within thirty days from the issue of written notice so to do, and such new work shall, in every respect, conform to these specifications.

The contractor will be required to construct forms of such material and in such manner that the finished work will, in all respects, be true to line and grade, and he will be required to use such tools, appliances and workmen as are necessary to secure first-class work.

Any deviation from line or grade, or inequalities of surface, or imperfect workmanship or poor material, of which the engineer shall be the judge, shall be cause for the rejection of the work.

SOME CONCRETE CONSTRUCTION IN ILLINOIS.

The accompanying illustrations show a variety of applications of concrete to construction in Illinois, and are excellent examples of the ordinary work with this material. We are indebted to the little book on "Crushed Stone and Its Uses," published by the Producers' Supply Company of Chicago, for these photographs and for data regarding the methods of construction.

The first and largest photograph shows during construction a monolithic concrete apartment house, which is said to have been the first building constructed in Chicago entirely of concrete. The exterior walls are monolithic and the method of construction is indicated in the photograph. The plainness of the surface is relieved by lines formed by beading on the boards of the forms. The picture shows the width of these boards and the failure of the beaded lines on the front and side of the building to meet, and thus exposes the inexperience of the builder. The warping of the wide boards during the construction has also caused inequalities in the surfaces, which can perhaps be detected in the photograph. These defects are of minor character and do not affect the strength of the building, although they do injure its appearance. They are attributed by an architect, who wrote a description of the building, to the ignorance of one of the owners of the building who, with no previous experience in construction, thought himself capable to direct the construction and so, while he was able to get a structure which is permanent and strong, he fell into the errors in finishing surfaces which many contractors of long experience in rough work are very apt to commit. The finishing of concrete surfaces is an art which comparatively few have mastered, and in which no one can expect to become proficient without considerable practice under competent guidance.

The concrete in this building is made of crushed stone and screenings, with a small amount of fine sand in the facing.

The second cut shows a self-supporting stairway of concrete, the only support of the steps being in their connection with the wall bounding the well of the stairway. Steel reinforcement may or may not be used in such stairways as this, and the stairway may be monolithic or it may be built in separate steps, put together after manufacture in the same manner as stone stairways of similar design. The surfaces are finished with marble screenings and can be highly polished if desired. These stairways are fire-proof and are not subject to the objections made to stairways with iron or steel supports.

Curbs, carriage steps, stairways and rails and bowls of fountains are exemplified in the third and fourth photographs.

The fifth picture gives a view of the Illinois Central railroad bridge over the Big Muddy river, which was described in some detail in MUNICIPAL ENGINEERING, vol. xxvi, p. 152. It is sufficient to say here that the abutments, piers and main arches are built of concrete, the former in proportions of 1 part cement, 2 1-2 parts sand and 6 parts crushed stone, and the last of 1 part cement, 2 parts sand and 5 parts crushed stone. The arch was divided into separate voussoirs, or arch stones, during construction. The spandrel arches and copings are of reinforced concrete. All faces are finished with a cement mortar to give a smooth and fine grained surface.

The last two cuts, the sixth and seventh, show views, before completion, of some concrete sewer and conduit work in Moline, Ill. The sewer shown in the sixth plate was built in an old tail race, in which there was a constant flow of sewage and water. It was founded on a layer of concrete two feet thick and

twelve feet wide. When this had set the walls of the sewer were built in forms up to the springing line of the arch, and when these forms could be removed, the centers for the arch were set and the sewer was completed. The inside diameter of the sewer is 7 feet and the arch and sidewalks are from 12 to 18 inches in thickness. The filling over the sewer was done from the railroad alongside, and this filling on one side first fully tested the strength of the construction, which carried it without a sign of weakness. The subway shown in the seventh plate is very nearly rectangular in construction, and connects buildings in the Moline shops of the same railroad, and contains various pipes and cables. It is also of concrete, with a flat concrete cover at the ground surface.

THE PROVIDENCE WATER WORKS.

The annual report of City Engineer Otis F. Clapp, of Providence, R. I., gives the usual clear statement of the work done during the fiscal year. The present report is for the year 1904, and includes the engineer's side of the work in the water, sewer, street and park departments.

The filtration plant is the large work in the water department. Some description of the plant and of its progress prior to 1904 will be found in MUNICIPAL ENGINEERING for December, 1904. During that year the six beds were completed. The first of the accompanying photographs is a view of the plant as seen from the top of the new chimney at the pumping station, and gives a clear view of the filtration plant as a whole, and of the progress of the construction of the various beds. The second photograph gives a nearer view of one of the beds, showing the drainage pipes for collecting the filtered water in place and part of the first layer of gravel. The third photograph shows the process of laying drain pipes and placing the three layers of gravel used in the bottom of the filtering area. The fourth photograph shows, in addition, the placing of the sand for the top layer of the filter.

Providence now has a high pressure service. The fifth of the accompanying photographs shows the methods of fastening lengths of pipe together on the curves at Exchange bridge, where it was necessary to deflect the line around the site for the new postoffice.

The city engineer's office has always kept accurate account of the work done under its direction, and reports it upon completion. Each year the cost of laying water pipe is given, and the figures in the report for 1904 are as follows, for pipe lines complete, with the exception of hydrants, computing the iron at $35 a ton:

4-inch pipe cost	$0.556	a foot
6-inch pipe cost	0.815	a foot
8-inch pipe cost	1.098	a foot
10-inch pipe cost	1.408	a foot
12-inch pipe cost	1.809	a foot
16-inch pipe cost	2.730	a foot
20-inch pipe cost	3.816	a foot
24-inch pipe cost	5.052	a foot
30-inch pipe cost	7.195	a foot
36-inch pipe cost	9.683	a foot

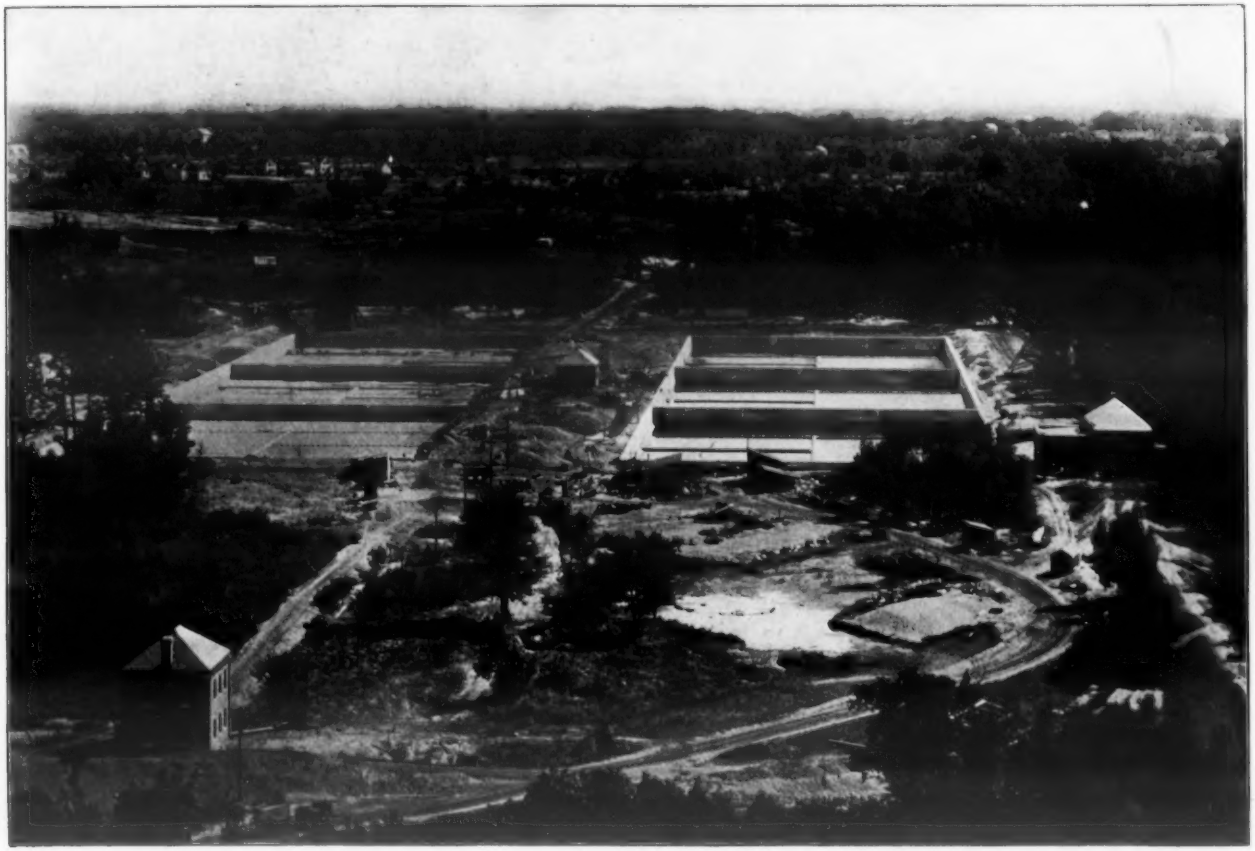
There are 20,489 meters on the 23,881 service pipes in use, that is to say, 86 per cent. of the services are metered, the effect of which is shown in the statement that the consumption of water is 67 gallons per capita per diem.

The high pressure fire service was extended about 100 feet during 1904, making the total length, 5.6 miles of 12, 16 and 24-inch pipe, of which 4 1-3 miles is 16-inch pipe. The regular domestic and fire service, not including the high pressure lines, comprises 345.7 miles of 6 to 36-inch pipe.

The works are evidently self-supporting, the receipts for 1904 being $670,700, and the cost of maintenance, $167,753. The net cost of the works, as they stand, not including interest, has been $6,638,894, and the revenues for water sold have been $11,909,058.

The cost of pumping water into the low service reservoir is $7.04 a million gallons, or 3.97 cents per million gallons raised one foot. The high service reservoir is filled from the low service reservoir at an additional cost for this service of $9.34 per million gallons, or $7.21 per million gallons raised one foot. The pressure on the mains at the center of the city is 64 to 73 pounds. The high pressure fire service mains have a constant pressure of 114 pounds at the same place.

We are indebted to Mr. Otis F. Clapp, City Engineer, for the accompanying photographs.



PROVIDENCE WATER FILTRATION PLANT AS SEEN FROM TOP OF PUMPING STATION CHIMNEY.

EDITORIAL COMMENT

The Panama Canal and its Engineers.

Some Problems of Engineers' Organizations.

The Block Machine Manufacturers.

THE PANAMA CANAL AND ITS ENGINEERS.

During the past six weeks the organization of the Panama canal has passed through another stage and some of the difficulties have again been indicated, although the real reasons for these difficulties are as far from demonstration as they have ever been.

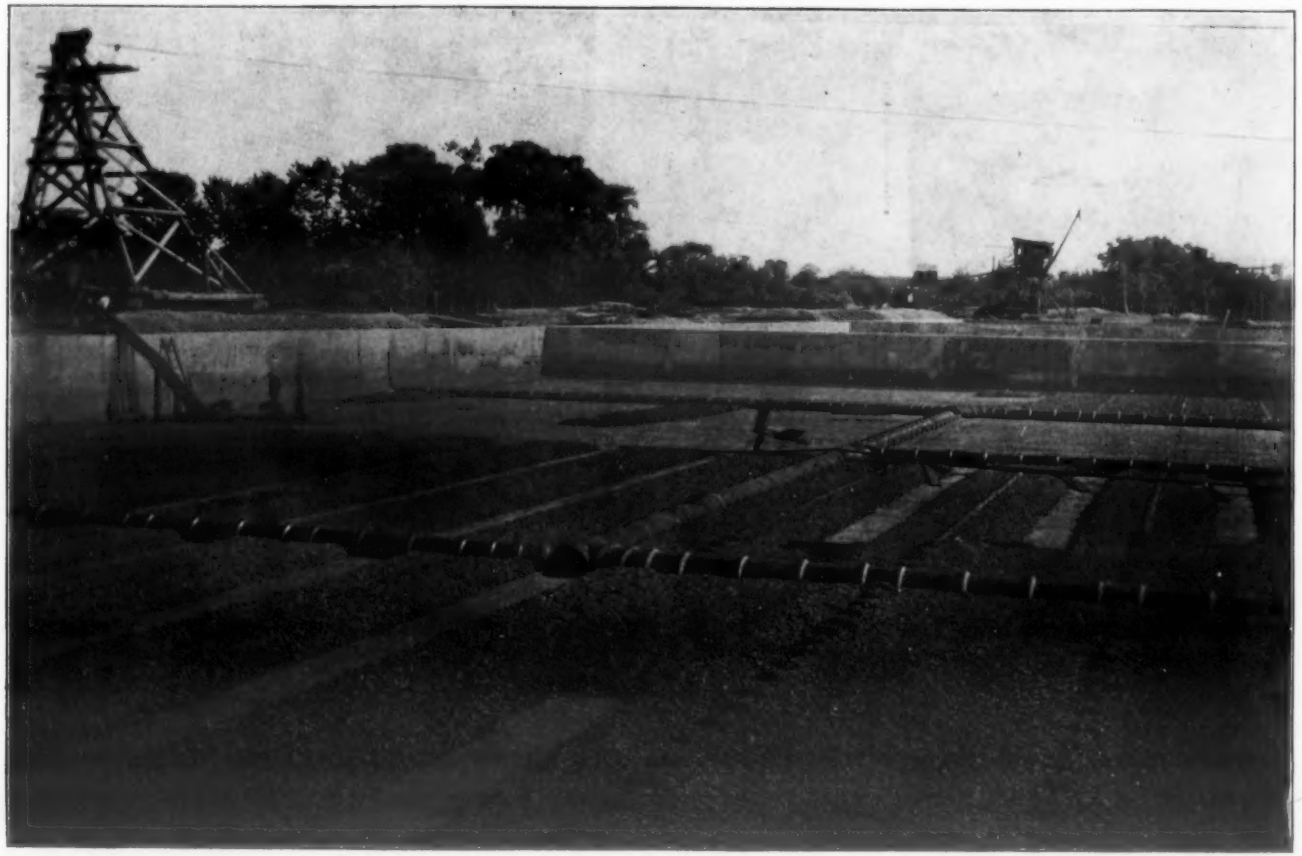
The first commission seems to have found its cause of failure in division of responsibility, five heads being too many for the work to be done, and as in municipal and other governmental operations, this division of responsibility gave too much opportunity for the professional "grafters" to ply their trade, whether within or without the organization is immaterial.

The first change, reducing the membership of the commission to three, one of which was chief engineer, did not improve matters very materially, for, to the outsider, at least, it seemed to give opportunities for conflict of authority which are not conducive to successful operation, especially when the chiefs are different in education, training and individual characteristics. It is not difficult, also, to presume that the searcher after methods of getting something for nothing should take advantage of this possibility of differences in opinions and methods to pave the way for future operations and to bring pressure to bear in untraceable ways upon those who interfere with these operations. Conflict of authority is no more satisfactory than too much division of authority and the second commission therefore had the seeds of failure in it, whether the ostensible reason for the change in it was due to this defect or not.

The new chief engineer goes to the isthmus without the office of commissioner attached to him and with the published statement, as reported by the newspapers, that he is in charge of the technical details of the canal construction and must take his orders as to general policy and plans from the commission, as formulated by it after consultation with its own engineers and with its advisory board. This promises better results because there is now no chance for division of authority nor for conflict of authority, and if the president of the commission and its chief engineer are as capable in their respective fields in the canal work as they have proved themselves to be in railroad work, there is but one reason why it will not go forward with efficiency and reasonable rapidity.

All through there has been the complaint of the galling restrictions of governmental red tape on hastening work and on reducing its cost, and these restrictions have not been removed. It is very doubtful whether they should be removed. System is necessary in canal and in railroad work, as well as in governmental work, and the system in use in the War Department is one which has been the outgrowth of many years of experience. That it differs from railroad systems is not sufficient reason for changing it. Indeed, it would seem the better policy to use this system and to employ under it the engineer officers of the United States Army, who have been brought up under it and who know how to carry it out, rather than to attempt to formulate an entirely new system, with new men, which will be subject continuously to the attacks of contractors and others who are adepts in the art of passing by inefficient safeguards and getting away with their plunder.

One reason for the mistakes in the attempts at organization is to be found in the over-estimate of the difficulties and magnitude of the task of building the canal from the standpoint of the management of the concern. The fact is that there are several cities in the United States, each of whose expenditures for what may be termed public improvements during a time equal to that which it will take to build the canal, are, or will be, equal to the estimated cost of the canal. The general policy on which these improvements are planned, or permitted, is in the control of a single responsible body in each of these cities, and these expenditures are made with a mere fraction of the public clamor and exaggeration of statement which the canal proposition has caused. The details are extremely complicated also, and there are many of them which could be better handled. The canal starts out as the largest single piece of construction, and is not a gradual growth, as the munic-



II. DRAINAGE SYSTEM IN PLACE WITH FIRST LAYER OF GRAVEL PARTLY PLACED. PROVIDENCE WATER FILTRATION PLANT.

ipal work has been, but otherwise it is not far different in principle, though the details of climate, hygiene, water, floods, materials, transportation, labor, and so on, are different and the methods of treating them must be devised anew.

They are all details, however, and can be worked out promptly and properly by a sufficient force of competent men under competent direction. Let us hope that we now have the latter and that the former are on the way.

It is unfortunate that outbursts of temper, on the part of men presumably experienced enough in intercourse with men to know better, have prevented the proper explanations of existing conditions to the authorities by the retiring engineer and commissioner. There are many expressions of earnest conviction that he owes it to the work, and to the country as well as to himself, to put all he knows on public records, the unofficial, if access to the official records has been denied.

SOME PROBLEMS OF ENGINEERS' ORGANIZATIONS.

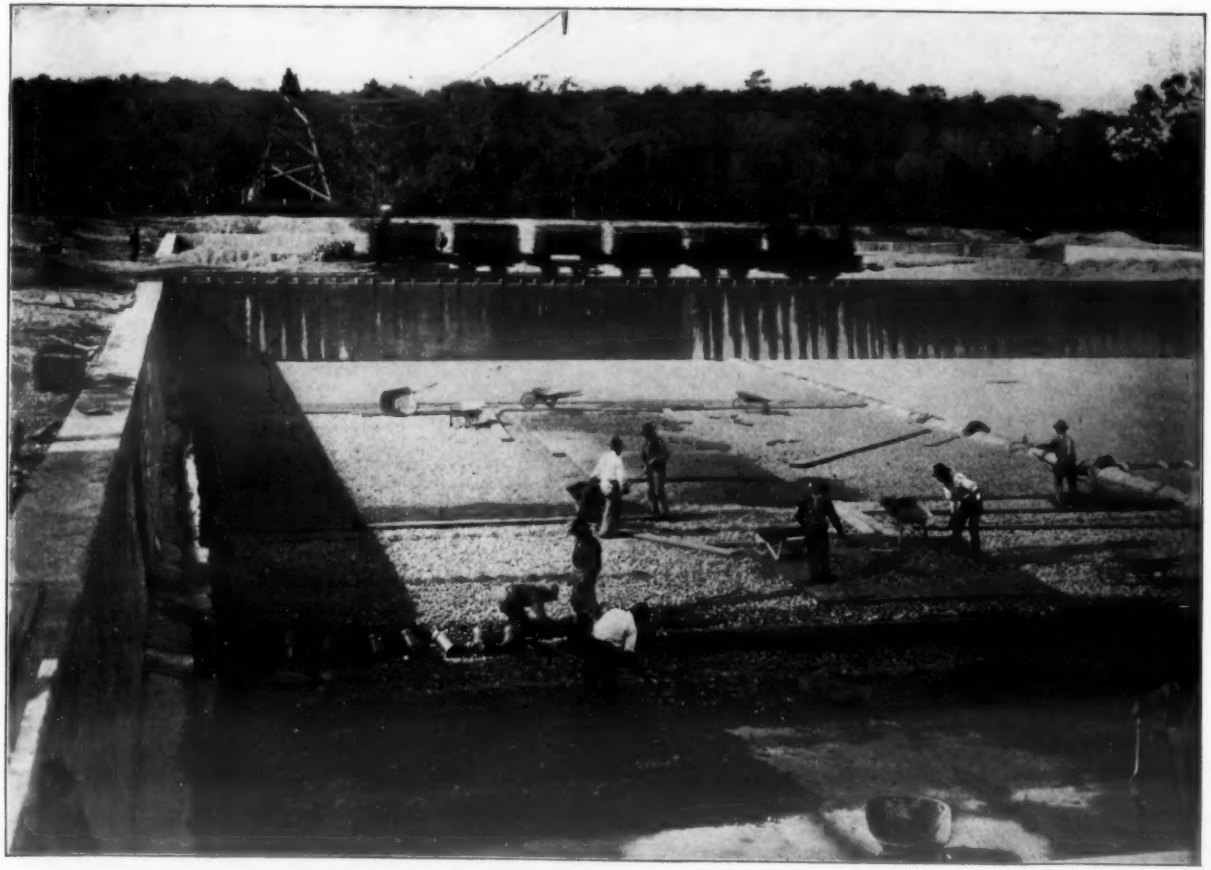
Two subjects of interest to engineers' organizations generally were up for discussion at the recent annual convention of the American Society of Civil Engineers. One of these was the relation of the society to local organizations and the establishment of local branches of the Society.

The average local society, whether of a city, a state or a district, is not a very vigorous body, and it does not impress itself very strongly upon the community. It requires careful nursing by those who feel that there are enough things which such a society can do to justify its existence and it quickly drops out of sight when these few cease their efforts. Ordinarily, there are not enough engineers of any one class to make a successful society, and the local engineer's practice is often so varied that he wishes to come into contact with the engineers of other classes. Therefore, the local society has a membership made up of civil, mechanical, electrical, mining, chemical, architectural and other engineers, and the proportions of the membership depend upon the local conditions, with the probabilities in favor of a preponderance of mechanical and electrical engineers. Then, the most stable class of members, those who attend the meetings and use the reading room, are the younger men, many of whom are not yet classed as engineers, but are as yet students or apprentices. One of the most valuable offices of a local society is to furnish a library and reading room for these young men and to bring before them, at the meetings, the engineers of the vicinity and elsewhere, to tell the results of their experience.

It is evident that a society of this sort has little in common with a national society made up of technical experts, even though the field of membership, as in the American Society of Civil Engineers, is broad enough to include all the classes represented in its membership. The qualifications for membership must be so different, the methods of operation are so diverse, that it is difficult to devise any method of combination other than the loosest kind of affiliation, such as is represented in the Association of Engineering Societies. Even this organization is too expensive for any but the stronger local organizations.

Affiliations of local organizations with a state society have been suggested, and the state society is usually inclusive enough to warrant such a combination, provided the various organizations have enough common interest to make it worth while. This is the principal difficulty in the way of a national organization of these local societies. Practically the only common object is the publication and exchange of proceedings, but when a society is barely strong enough to pay its room rent and the subscriptions to a few periodicals, this does not appeal to it very strongly, especially since the members find the most valuable papers of the societies united in issuing such a publication abstracted in the periodicals devoted to their specialties.

Another question discussed at the convention was the selection of experts for work upon public or other commissions. This question has been discussed occasionally in the past and came up at this time, probably on account of the proposition that the American Society of Civil Engineers be requested to appoint some engineering members of a commission to be appointed to consider some of New York city's municipal problems. Very properly the convention voted unanmiously not to subject its board of direction to the criticism to which it would be open if it were required to perform this duty;—very properly, that is, from the standpoint of a national society. The technical ability of an engineer is not the only qualification necessary for such an appointment. Knowledge of the situation, ability to co-operate with the other members of the commission, standing in the particular community, are also important factors in the choice. The board of direction of a society has no interest in any of these things. It would bring upon itself a flood of criticism which has no justification in its connection with the case, since it has no such connection, and



III. PLACING THE THREE LAYERS OF GRAVEL AND LAYING DRAIN PIPE. PROVIDENCE WATER FILTRATION PLANT.

it should not be subjected to such treatment. The records of the society may very properly be opened to such inquirers and information furnished regarding any and all engineers among its members having the qualifications desired, and in local societies this information may often be necessarily less formal than that on file in the offices of national societies. Much assistance of this sort can be given but the actual choice must be made by those among whose duties this action falls, and who, by their official positions, must be responsible for the consequences of the decision.

THE BLOCK MACHINE MANUFACTURERS.

The report of the recent convention of the makers of concrete block machinery, to be found elsewhere in this number of MUNICIPAL ENGINEERING, gives an account of the meeting, and there is room here but for a few words of comment.

There are several problems which confront the block machine makers and dealers, and some conditions for which nearly all of them are directly responsible. The number of patents on new machines, blocks and processes, and improvements on them, has averaged fully one a month for the past six or eight years, most of these patents having been issued during the past three or four years. The question of patents was not, however, a subject the discussion of which occupied much time at the convention, a single paper representing the whole.

Freight rates on machinery, and especially on pallets and other rough parts, and on blocks, interested all of those present, but, with excellent judgment, the convention referred the matter of freight classification to a committee, with instructions to secure as uniform a classification by the various railroad associations as possible and in as low classes as possible.

The most important subjects before the convention were the closely related ones of quality of blocks and fire insurance rates. The paper by Mr. E. T. Cairns, given in full in the report of the convention, states the position of the insurance organizations, and indicates the lines of experiment which the insurance laboratory, of which Mr. Cairns is the director, expects to follow in securing information upon which to base an intelligent fixing of insurance rates on buildings of concrete blocks. He makes a strong point of the necessity for proper specifications for the materials and mixtures to be used in blocks and for first-class workmanship. The general plans for investigations of concrete and concrete materials by the United States government departments, by universities and private laboratories, were stated in the course of the discussion, and the desirability of co-operation with them was fully recognized by those present. A committee was appointed to look after the interests of the block makers in the investigations of concrete and its applications, and also in the experiments at the insurance laboratory upon the resistance offered to fire by concrete blocks of various designs, mixtures of materials and methods of construction. It seems to be clearly understood that the position of concrete blocks in the list of building materials, with regard to their fire-resisting qualities, depends almost entirely upon the specifications under which they are constructed, and that, therefore, the questions of specifications and of fire insurance are largely identical.

The progressive block and machine makers recognize also that mistakes have been made, and are now made, by the sellers of block machines in their instructions to purchasers regarding materials and methods of manufacture, and that many of the purchasers of machines are ignorant of the properties of cement and of the methods of getting the best results out of it, and that the block machine makers must do a large amount of educational work upon the people to whom they have sold machines, in order to fit them to overcome the prejudices against the new building material, which have been aroused by the poor quality or the poor appearance of the blocks turned out. There are some fundamental principles of the construction of concrete blocks which are well established, and which the prospective experiments will change but little, if any, and it is proposed to publish a statement of these principles as a preliminary specification for the guidance of the inexperienced block makers until the official experiments can be made and the official specifications can be prepared. This is an excellent suggestion and the committee on experiments and specifications was authorized to prepare such a set of general instructions as could be applied to the conditions in the ordinary block plant.

These efforts of the block machine people to secure the adoption of high standards of quality of blocks will ultimately make up for their neglect and their positively bad methods of the past, and the fact that they are made by an organization of the block machine makers, even though that organization contains but a small fraction of the owners of block machine patents, will give the specifications adopted by them an authority which will

IV. PLACING SAND, GRAVEL AND DRAINS. PROVIDENCE WATER FILTRATION PLANT.

greatly aid in their adoption by the block makers.

The relations of the block makers to the architects was the subject of one of the talks before the convention, but this subject was not given the attention which its importance demands. Perhaps this is because the machine makers have not yet awakened to its importance. They have progressed to a full recognition of the necessity for a strict specification covering both quality and appearance of blocks, which is a great point gained, and the larger and equally important question of the position of the architect regarding the matter will come to the front when the questions of quality and appearance show signs of being settled.

The association which was formed states its purpose definitely to consider questions of interest to the block machinery makers, and is closely limited in membership to one representative from each company making the machinery or molds for the manufacture of concrete blocks. It must always be, therefore, a small organization, but it should have great influence upon conditions in the trade. It apparently expects to co-operate actively with the National Association of Cement Users and with all other organizations interested in its field and should accomplish much good. Some statement of the discussion of other subjects at the convention will be found in the report of the proceedings elsewhere in this number.

THE QUESTION DEPARTMENT

INFORMATION ABOUT ELECTRIC LIGHTING FOR CITIES.

Will you kindly furnish us with the information at your command in regard to the electric lighting of cities, what rates are charged, and such other information as will be valuable to us in making contracts to light our city?

M. H. THOMPSON,
Secretary Chamber of Commerce,
Zanesville, O.

Reference to sources of information is all that can be attempted here. MUNICIPAL ENGINEERING has many articles upon all phases of the subject of electric light. Following is a list of the more important articles bearing on the subject of contracts and rates:

"Regulation of Gas and Electric Rates in San Francisco," vol. xxviii, p. 295.

"Report of Massachusetts Light Commission," vol. xxviii, p. 398.

"Cost of Electric Light," vol. xxvii, p. 200.

"The Municipal Electric Lighting Plant at Richmond, Ind.," vol. xxvii, p. 130, and vol. xxiv, p. 122.

"Minimum Rates for Water, Gas and Electricity," vol. xxvii, p. 195.

"Street Lighting," vol. xxvii, p. 288.

"Improvements in Electric Arc Street Lighting," vol. xxvi, p. 252.

"Prices Charged for Gas and Electric Light," vol. xxvi, p. 410.

"Costs and Prices of Gas and Electric Lighting by Municipal Plants," vol. xxv, p. 232.

"Street Lighting in Rochester, N. Y., and Report on Prices and Cost," vol. xxv, pp. 356 and 357.

"The Cost of Electric Light and Electric Light Plants to Municipalities," vol. xxiv, p. 6.

"Incandescent Street Lighting," vol. xxiv, p. 178.

"Statistics on Electric Lighting," vol. xxiv, p. 273; also Bulletin No. 6 of the League of American Municipalities.

"A Valuable Report on Municipal Lighting," made for New York City, vol. xxiv, p. 292.

"Investments and Earnings of Municipal Electric Plants," vol. xxiv, p. 344.

"Form of Contract for Electric Lighting Service," vol. xxiii, p. 20.

"Measurements of Lights and Electric Current," vol. xxiii, p. 106.

"Cost of Light in Municipal and Private Gas and Electric Plants," vol. xxiii, pp. 160, 168.

"Prices of City Electric Lighting," vol. xxiii, p. 175, and the annual report of the U. S. Commissioner of Labor for 1899 on "Water, Gas and Electric Light Plants."

"Arc Lighting Statistics," vol. xxiii, p. 363.

"Electric Street Lighting," vol. xxiii, p. 364.

V. FASTENINGS FOR CURVED HIGH PRESSURE FIRE SERVICE PIPES. PROVIDENCE, R. I.

"Equipment and Operation of Municipal Electric Light Plants in Massachusetts," vol. xxiii, p. 434.

"Electric Light Rates," vol. xxii, p. 106.

"Cost of Constructing and Operating Municipal Electric Light Plants in Cities of 50,000 Population," vol. xxii, p. 158.

"Cost of Electric Light in Iowa," vol. xxii, p. 322.

"Worcester Reports Against Municipal Ownership of Electric Light Plant," giving much information as to cost and prices, vol. xxii, p. 331.

"Some Averages of Electric Light Costs and Charges," vol. xxii, p. 415.

"Indianapolis Electric Light Specifications," vol. xxi, p. 43.

"Cost of Street Lighting," vol. xxi, p. 76.

"Cost of Arc Lighting Plant," vol. xxi, p. 157.

"Cost of Electric Light in Crawfordsville, Ind.," vol. xxi, p. 347.

"Prices of Electric Street Lighting in Massachusetts," vol. xxi, p. 387.

"Electric Lights for Small Cities," vol. xx, p. 161.

"Street Lighting," vol. xx, p. 177.

"Rathmines Municipal Electrical Plant," vol. xx, p. 193.

"Cost of Municipal Lighting in Massachusetts," vol. xx, p. 236.

"Why Some Municipal Electric Light Plants Do Not Pay Better," vol. xix, p. 103.

"Statistics on Electric Street Lighting," vol. xix, p. 255.

"Cost of Light from the Electric Arc," vol. xvii, p. 65.

"Cost of Lighting by Incandescent Street Lamps," vol. xvii, p. 185.

"Electric Street Lighting in American Cities," giving data regarding cost, vol. xv, p. 276.

CONTRACT TO PROCURE FRANCHISE INVALID.

I read in one of your issues not long since a decision of some court of the illegality of the franchise which was given to a water or light company, under circumstances about as follows: An individual had received an offer from another party for a franchise for water or light, or both perhaps, in consideration that he would secure the same through the regular channels of the municipality. The court held that the franchise was illegal for the reason that the party secured the franchise simply for barter. I would thank you to refer me to this decision. S. *S.*, Florence, S. C.

The article referred to is probably that entitled "Contract to Obtain Municipal Franchise is Invalid," in vol. xxviii, p. 457.

It will be noticed that this decision is by a United States circuit court, and is not that the franchise obtained was invalid, but that a contract to procure such a franchise in return for certain promised payments of cash and bonds was invalid. The question of the validity of the franchise does not seem to have been before the court. The writer knows of no decision involving the validity of a franchise obtained under such a contract.

WATER PIPE OF CEMENT AND CLAY.

Will you please answer through your journal whether there is a pipe made, either of cement or clay, that is satisfactory for water mains? If so, we would like to have the addresses of the manufacturers of the machines, and also of manufacturers of the pipe.

A. W. P., Artesia, N. M.

Water mains for use under pressure are now constructed of reinforced concrete in France, Germany and other European countries, but have not yet made their appearance in this country. Marsh's "Reinforced Concrete" ($7) gives descriptions of the various methods of reinforcement. This pipe is constructed in place, ordinarily. Pipes for use under low pressure or in sewers and conduits are made of cement on machines, or in place. Vitrified clay pipes are also used for water conduits under no pressure or very slight pressure. A list of makers of both kinds of pipes and of makers of machinery for pipe manufacture will be found in the "Business Directory" published in each number of MUNICIPAL ENGINEERING, under the headings, "Sewer Pipe," "Vitrified Culvert Pipe," "Cement Pipe Molding Press," "Cement Sewer Pipe," "Cement Sewer Pipe Machinery," "Concrete Conduits," and "Expanded Metal Construction."

PAPERS ON SAND-LIME BRICK AND CONCRETE BLOCK CONSTRUCTION.

I asked you some questions, to be answered through MUNICIPAL ENGINEERING, which I find fully answered in the "Handbook for Cement Users," which has just been received, but I should be very much obliged if you would inform me where I can get a copy of the complete paper by Mr. S. V. Pepple, on sand-lime brick, and also on concrete blocks, by Mr. Paul Wilkes, of Cleveland?

J. W. S. EDDY,
Regina, N. W. T.

Each edition of the "Handbook for Cement Users" ($3) contains all the permanent matter which has appeared in MUNICIPAL ENGINEERING on the subject of concrete prior to the publication of that edition, and it answers all questions except those on the very latest developments, and those which call for applications of the methods described in it to special problems.

The full paper by Mr. Pepple, on sand-lime brick manufacture, will be found in the proceedings of the American Ceramic Society for 1903 ($4). Mr. Wilkes' paper is printed in pamphlet form, with the title "How to Make Hollow Concrete Blocks" (50 cents). MUNICIPAL ENGINEERING can supply them at the prices named.

CEMENT SIDEWALK BLOCKS.

I would ask are there any parties making a sidewalk block up to 4x4 feet, and using expanded medal or wire cloth for strengthening or reinforcing the same? If there are any blocks of this kind made I would very much like to hear from the parties making them.

NICHOLAS HOTTON,
Portville, N. Y.

G. D. Rowell & Son, Appleton, Wis., and the Miracle Pressed Stone Co., Minneapolis, Minn., make machines for constructing sidewalk blocks, and doubtless these machines will permit the use of reinforcement. The various expanded metal companies supply material for reinforcing sidewalk blocks and their catalogues show the method of constructing the blocks. A catalogue will be sent on application by the Associated Expanded Metal Companies, 256 Broadway, New York City.

INFORMATION ABOUT CONCRETE BLOCKS AND MACHINES AND THE ASSOCIATION OF CEMENT USERS.

Would you kindly furnish me names and address of manufacturers of cement block making machinery. Also the names of journals or periodicals that publish matter in the interest of the cement block business?

I would like to have the address of the vice-president of the section on concrete blocks and cement products of the National Association of Cement Users.

PERRY E. CHURCH,
Clay City, Ind.

There are many manufacturers of concrete block machines. Perhaps the best list is that given in the "Business Directory," printed in MUNICIPAL ENGINEERING, under the heading, "Concrete Blocks." This magazine is also the source of the best and fullest information on the subject or concrete blocks. The vice-president of the section on concrete blocks and cement builders of the National Association of Cement Users is B. L. Simpson, of Kansas City, Mo.

HOW TO BUILD CEMENT SIDEWALKS.

In response to the inquiry of W. B. N., in the July number of MUNICIPAL ENGINEERING, for information about methods of building sidewalks, it has been suggested that the various Portland cement companies issue full directions for this class of work which are usually representative of the best practice. Those which have come to the writer's knowledge are booklets and cards issued by Samuel H. French & Co., Philadelphia, Pa.; The Vulcanite Portland Cement Co., Philadelphia, Pa.; The Whitehall Portland Cement Co., Philadelphia, Pa.; The Buckeye Portland Cement Co., Bellefontaine, Ohio.

INFORMATION ABOUT CONCRETE BLOCK MACHINERY.

I want all the information I can get about machines for making concrete blocks.

JOHN P. SCHNEIDER,
Deerfield, Ill.

The best place to get the information desired is MUNICIPAL ENGINEERING. This magazine, during the past three and a half years, has given information about all the advances made in concrete and its uses, including descriptions of nearly all the practical concrete block machines which have appeared. A subscription, beginning with January, 1902, will get them all.

Detailed information about particular machines can best be obtained from the makers of the machines, a list of which will be found in the "Business Directory," published in each number of MUNICIPAL ENGINEERING, under the heading, "Concrete Blocks."

CEMENT AND SAND-LIME BRICK MACHINERY.

Can you give me the name of firms who are putting up plants for the making of sand-lime brick, and also cement brick?

W. A. P., Columbus, Ohio.

The names of such persons will be found in the "Business Directory" published in each number of MUNICIPAL ENGINEERING, under the headings, "Sand Brick," "Cement Brick Machinery," and some of the firms under the headings, "Concrete Blocks" and "Concrete Construction Machinery," also supply machinery for making cement bricks. Under the first heading, the H. Huennekes Co., New York city, establishes plants for making sand-lime brick. The others under this heading and the next, supply machinery for making cement brick. Under the last two headings the Miracle Pressed Stone Co., Minneapolis, Minn.; James P. Hall, Jersey City, N. J.; Concrete Machinery Co., Detroit, Mich.; Queen City Brick Co., Traverse City, Mich.; E. W. Seamans, Grand Rapids, Mich., advertise cement brick machines, and others in these two lists may also be able to furnish them.

SIDEWALKS OF CONCRETE BLOCKS.

Have you any data at your disposal with reference to the building of cement sidewalk blocks in a stationary plant and afterwards laying them on the foundation course prepared for them? If so, I should be much obliged for any information you can give me regarding such data, and for answers to the following questions:

1. What is the rough cost of machinery complete for the plant required?
2. How does the cost of manufacture by machine of sidewalk blocks and the laying of the same compare with the building of a concrete sidewalk in place?
3. Have such methods been proved satisfactory as to life, etc.?

Also, I should be grateful for the names of any corporations laying cement sidewalks in the manner referred to.

H. B. R. C., Kingston, Ont.

The names of makers of machines will be found in the answer to question headed, "Cement Sidewalk Blocks." These firms will give information as to cost of their outfits and cost of making the sidewalk blocks in them, with which the local cost of laying sidewalks in place can be compared, when the cost of laying the sidewalk blocks has been added to the cost of manufacture.

The making of sidewalk blocks, with and without reinforcement, to be set in place afterward, is more popular in England than in this country. Possibly it is thought that the blocks should be subjected to pressure, as machines are used in some plants for compressing them. But many blocks are made without pressure.

The method seems to be satisfactory in England. It has been in use in this country for so short a time that there are no reports regarding it here.

It seems to the writer that the making of the sidewalk in place would be more satisfactory when it is to be laid on the earth, but that there are distinct advantages in making the blocks in a machine or mold and afterward putting them in place when the sidewalk or floor is to be laid over an areaway or where it is advisable to support it independently of the soil. Reports from our readers who have had experience will be welcome.

The machine manufacturers will give information as to the location of the plants which they have established. There are as yet but few.

OVENS, CATCH BASINS AND MANHOLES OF CONCRETE.

Kindly advise me of any book or magazine article of any consequence you may know of that deals with the construction of bakers' ovens, the kind usually built under sidewalks in front of stores in large cities. I would suggest that you treat this subject with some degree of fullness in an early issue, and with especial reference to the use of concrete in their construction, giving plans, specifications and full particulars as to the kind and quantity of necessary reinforcement. I would offer the same suggestion regarding the building of sewer catch basins at the corners of intersecting streets and at other points, manholes, etc. It would seem to me that a saving over present methods could be effected here.

J. B., Brooklyn, N. Y.

The use of concrete in ovens is a subject which has not yet been taken up. The effect of heat, intense or long continued, upon concrete has not yet been thoroughly studied, and until the proposed series of experiments has been made progress will probably be slow. Sewer catch basins and manholes are now built of concrete, either plain or reinforced, and can be constructed in monolithic or block form. All the recent books on concrete give suggestions in this line, and some short descriptions of such structures have appeared in MUNICIPAL ENGINEERING from time to time. We shall be glad to publish any further plans or descriptions of such structures as those mentioned by our correspondent if our readers will send them for that purpose.

FACTORIES OF HOLLOW CONCRETE BLOCKS.

Where have factories of two or three stories, on the floors of which machinery is placed, been built of hollow concrete blocks? A. J. R., Indianapolis, Ind.

Three-story factories have been built in Waterloo, Ia., but whether as warehouses for factories or with machinery on the upper floors is not known to the writer. Can our readers give us any definite information on this subject?

BOOKS ON CEMENT.

We are looking for books on the use of cement that will be of value to farmers. If you know of anything of that kind we would be glad to have you give us the addresses of the publishers.

WALLACE'S FARMER,
Des Moines, Ia.

There is nothing that will answer this description exactly. There is much in the "Handbook for Cement Users" ($3), published by MUNICIPAL ENGINEERING Co., Indianapolis and New York, which can be used with profit. MUNICIPAL ENGINEERING MAGAZINE ($2 a year) itself contains much of interest to those who are not technically educated in the use of cement. Wilkes's "How to Make Hollow Concrete Blocks" (50 cents) is a short non-technical description in pamphlet form of one of the uses of cement. It is published by Paul Wilkes, Wick Block, Cleveland, Ohio. Hagloch's "Art Stone" ($1) carries the same subject a little farther. The book was issued by the Art-Stone Publishing Co., of Cleve-

land, Ohio, and may not now be obtainable. Any extension of this list enters the list of books which are entirely technical and would probably go beyond the purposes of our correspondent.

WHO SUPPLIES GRANITE SCREENINGS.

Can you send me the addresses of any firms, favorably situated as to freight rates, that can furnish granite siftings for top coat work, for delivery at Canal Dover, Ohio? E. J. L.

Names of dealers in crushed granite in Wisconsin and in the East are given in MUNICIPAL ENGINEERING, vol. xxiv, p. 357, and xxiii, p. 32. Can our readers refer our correspondent to dealers nearer to his locality? The St. Louis Crushed Quartz Co., St. Louis, Mo., furnishes a hard stone, not granite, for top finish of walks, curb and gutter.

BOOKS ON REINFORCED CONCRETE.

What we want is a reliable treatise upon reinforced concrete, and we want it entirely reliable. Can we get this information in your "Handbook for Cement Users" or your magazine?

F.-T. CO., Louisville, Ky.

The "Handbook for Cement Users" ($3) gives a full list of the various methods of reinforcing concrete and descriptions of a number of structures using it. MUNICIPAL ENGINEERING, from month to month, gives descriptions of various applications of steel reinforcement to concrete structures and of tests of their strength, durability and resistance to fire.

Books going into the theoretical discussion of the use of reinforcement in concrete and giving methods of designing have recently been issued, but some of them must be used with care, as they have been so hastily prepared that they do not agree fully with themselves nor with each other. The most reliable is Marsh's "Reinforced Concrete" ($7), an English book. The most practical is Taylor and Thompson's "Concrete, Plain and Reinforced" ($5). Buel and Hill's "Reinforced Concrete" ($5) is a good report of recent work of this sort. Two of these books are reviewed in the July number of MUNICIPAL ENGINEERING.

MOLDS FOR CEMENT WORK.

Could you give me the addresses of any firms who make iron molds for making cement flower vases?

J. F. GARDNER,
Ft. Worth, Tex.

I saw accidentally in one office I visited in the country, on the front page of a journal, an advertisement for wood, plaster and iron molds. I would be pleased if you could give me the address of a firm that furnishes such molds, as I am interested in that line, and I believe a great many cement users are in the same way interested, and I am sure a great many would like to know such firm.

J. M., Steubenville, O.

The firm referred to is probably the American Art Stone Mold Co., 74 Muirson street, Cleveland, Ohio. Other makers of such molds are J. M. Keith & Co., Des Moines, Ia.; Dietz, Franklin & Co., Akron, Ohio, and others whose names will be found in the "Business Directory" printed in each number of MUNICIPAL ENGINEERING, under the heading, "Concrete Construction Machinery."

WHERE RATTLER TESTS OF BRICK ARE MADE.

Will you kindly inform me where I can secure a rattler for testing paving brick according to the N. B. M. A. standard, or where I can have such tests made, and by whom?

F. H. WRIGHT, City Engineer,
Helena, Ark.

The N. B. M. A. standard permits the use of the ordinary foundry rattler, approximating in dimensions those fixed by the standard. If the dimensions differ greatly the results are not strictly comparable with the results obtained with the standard rattler. If you can not find such a rattler in the foundries in your city, you can have the tests made at Washington University, St. Louis. It is probable that the University of Missouri, at Columbia; Kansas State University, at Lawrence, Kans., and Vanderbilt University, at Nashville, Tenn., are also equipped for making the rattler test of brick. The Talbot-Jones rattler referred to in the report on standard tests of the N. B. M. A., is at the University of Illinois, Champaign, Ill.

PAVEMENTS OF TREATED WOODEN BLOCKS.

Knowing that Indianapolis has much wooden pavement, I would like to know what satisfaction it has given and whether the timber is creosoted or otherwise treated.

F. H., Kansas City, Mo.

We have a large amount of wooden block pavements in this city, the first of which was laid in 1895. This first pavement was of red cedar or red wood which is a soft timber and it was not creosoted. It is now showing wear on account of its softness. There are other redwood pavements which were dipped in creosote, but this treatment has not materially aided them, and they are coming to the same condition that the first pavements have reached.

Later pavements have been laid of long leaf yellow pine blocks, creosoted with

various amounts of creosote, from perhaps three or four pounds to the cubic foot, up to ten or twelve pounds. These blocks are nearly all of them in good condition, those with the lesser amounts of creosote being less satisfactory than those with the larger amounts.

The principal trouble with all of the streets described above has been that the blocks shrink in dry weather and in very cold weather, and expand when rain comes after dry spells. This expansion causes the pavements to bulge and arch, and when the arches become too great, they fall down, and these spots become merely piles of block instead of a block pavement. The untreated blocks acted in this manner from the first. The creosoted blocks keep their places for, perhaps, three or four years, but by that time the creosote has evaporated or washed out sufficiently to allow the shrinkage and expansion described and they are therefore but little better than the untreated blocks in this respect. This simply means that there must be some expense for maintenance of the streets in relaying the blocks which have been displaced by the expansion. With proper maintenance of the streets they retain their good surface, which is in all cases, except those of the soft wood pavements above described, a smooth, even surface, practically equal to a new pavement, the only exception to this being where blocks have been laid on the side, or there is a defective block. In these cases a hole is formed, which rapidly spreads. Proper maintenance removes this difficulty, as the blocks are taken out before the hole has begun to spread.

The people have been very well satisfied with these pavements, but have been looking for something better. One of the companies which creosotes blocks has been experimenting with an oil which is heavier than creosote with the expectation of producing an oil which is not soluble in water. Such an oil will retain its position in the blocks, and will thus keep them permanently free from decay and will permanently prevent the water from entering the fibers of the wood and will thus reduce the cost for maintenance and the chance for objectionable action of the pavement, such as been described above. They think they have found this in what they call kreodone oil. A number of pavements laid during the last six years have been laid with blocks treated with this oil, and these pavements bear out the promises of the makers of the oil very well indeed. These streets have shown very little tendency to absord water and they are in as good condition now as at the time they were laid. There are other companies who make similar claims for methods of treatment of the blocks, but this is the only special oil which has been used in this city. It is very satisfactory and the blocks treated with it make streets which retain their smooth surface and which do not show any sign of decay as yet, and have given a very small amount of trouble from absorption of water, as compared with the streets made with blocks not treated or treated with commercial creosote.

BOOKS ON BRICK AND TILE MAKING.

Please give me names of books on the manufacture of clay brick and clay tiling.
A. V. B., Franklin, Ky.

Following are names of good books on brick manufacture:

Morrison and Reep's "Brickmakers' Manual" ($3).

Griffen's "Clay Glazes and Enamels" ($5).

"Sixty Years a Brick Maker" ($2.50).

Crary's "Brick Making and Burning" ($2.50).

Wheeler's "Vitrified Paving Brick" ($1).

Seger's "Collected Writings," 2 vols., ($7.50 each) cover the whole field of clay manufacture. This is the American edition, translated from the German.

"Science of Brickmaking," English ($1.25).

CITIES HAVING OILED ROADS.

Will you kindly send me addresses of city engineers who have been or are experimenting with crude petroleum for roads.
W. L. THOMPSON, Village Engineer,
Ridgewood, N. J.

The successful use of crude oil in making good roads in California and the reasons for successes and failures are described in MUNICIPAL ENGINEERING, vol. xxviii, p. 201. The cities and towns mentioned in the article are Bakersfield, Kern, Riverside, Corona, Colton, Redlands and San Francisco. The city engineers of these cities and the superintendent of Golden Gate Park, San Francisco, can give full information.

Some unsuccessful experiments have been tried in Iowa, Missouri, New Jersey and elsewhere. Oil with an asphalt base was not used, and the methods of application and the influence of conditions were not known, and the failures are therefore easily accounted for.

The late New Jersey State Commissioner of Public Roads is reported to have considered favorably the proposal to experiment under expert direction with the proper oils on the roads of that state. The intention of the present commissioner is not known by the writer.

WIDTHS OF PAVEMENTS.

Will you please refer me to the back numbers of your magazine that show the modern practice in a number of towns in the width of streets between curbs and the width of sidewalks and grass plats on each side?

A. H. KENNEDY,
Rockport, Ind.

The following articles in MUNICIPAL ENGINEERING discuss the subject of widths of streets between curbs: Vol. xxv, p. 166, is an editorial on the subject. On page 172 of the same number will be found a statement of the widths of streets between curbs in a number of different cities. On page 379 of the same volume will be found statements of the standard widths of pavements between curbs for streets of various widths in Indianapolis. Other articles will be found in vol. xxi, p. 75; vol. xv, p. 309; vol. iv, pp. 256 and 257.

BOOKS ON ROAD CONSTRUCTION.

Can you tell me of any late book on roads and road construction, with estimates, costs, etc. I want such a book, one that shows sections of roads, construction, maintenance, etc.

CHARLES H. ECKERSON,
Englewood, N. J.

The best book on the subject of modern road construction is Baker's "Roads and Pavements" ($5). Other excellent books are Tillson's "Pavements and Paving Materials" ($5) and Byrne's "Highway Construction" ($5). The author of the book last named is reported to have gained his experience on New Jersey roads. The annual reports of the New Jersey Commissioner of Highways contain much valuable information and many figures of cost.

MAKERS OF ICE PLANT MACHINERY.

Please give me the addresses of manufacturers of ice plant machinery.

R. H. T., St. Petersburg, Fla.

There are fifty or sixty makers of ice and refrigerating machines in the country, as given in Hendricks' Directory. The following are among the leading manufacturers of the various machines: American Linde Refrigeration Co., 120 Liberty St., New York; Atlanta Machine Works, Atlanta, Ga.; Brown-Cochran Co., Lorain, Ohio; Buffalo Refrigerating Machine Co., 141 Broadway, New York; Carbondale Machine Co., Carbondale, Pa.; Castle Ice Machine Co., Indianapolis, Ind.; DelaVergne Refrigerating Co., foot of E. 138th St., New York; Frick Co., Waynesburg, Pa.; E. J. Moore Machine and Foundry Co., 2227 Wood St., Philadelphia, Pa.; Murray Iron Works Co., Burlington, Iowa; Newburgh Ice Machine and Engine Co., Newburgh, N. Y.; Tropical Ice Machine Co., 126 Liberty St., New York; United Iron Works Co., Springfield, Mo.; Vilter Mfg. Co., 1046 Clinton St., Milwaukee, Wis.; Zero Refrigerating Machine Co., 206 Broadway, N. Y.

MAKERS OF PORTABLE HOUSES.

Please advise if there are any firms in your vicinity who manufacture portable houses.

R. H. P., St. Louis, Mo.

The firms known to the writer in the central states which make portable houses are Charles Amos & Co., 94 West Larned street, Detroit, Mich.; Iron Cottage Co., Grand Rapids, Mich.; Mershon & Morley Co., Saginaw, Mich. See MUNICIPAL ENGINEERING, vol. xxii, p. 29, for additional names in other parts of the country.

BOOKS ABOUT GAS.

Do you know of any books pertaining to piping, distributing and testing of natural gases? If you do, I would be pleased to have a list of them.

W. R. GLASGOW, Shiloh, O.

O'Connor's "Gas Engineers' Pocket Book" ($3.50) contains tables, notes and memoranda on the manufacture and distribution of gas. Newbigging's "Handbook for Gas Engineers and Managers" ($6) should have some information applicable to this case also. Gill's "Gas and Fuel Analysis" ($1.25) and Bates's "Technical Gas Analysis" ($1) should give methods of determining the fuel and light values of gas. Brannt's "Petroleum and Its Products and Natural Gas" ($7.50) is said to be a valuable book.

MAKERS OF STREET CAR FENDERS.

We are beginning an investigation into the merits of the various street car fenders and guards, and I shall be glad of any suggestion you can make as to what companies make fenders and the comparative merits of their devices.

C. D. WILLARD,
Secretary Municipal League,
Los Angeles, Cal.

Among the makers of car fenders are the following: Baltimore Car Wheel Co., Baltimore, Md.; J. G. Brill Co., Philadelphia, Pa.; Fred'k J. Graf, 47 St. Mark's Place, New York City; McGuire-Cummings Co., Chicago, Ill.; Consolidated Car Fender Co., New York City; E. L. Dunning Co., Boston, Mass.; Eclipse Car Fender Co., Cleveland, O.; Hunter Automatic Fender Co., Cincinnati, O.; New Haven Car Register Co., New Haven, Conn.; Geo. A. Parmenter, Cambridgeport, Mass. No one fender is suited to every condition, and choice must be made for the duty to be performed.

BOOKS ON CEMENT INDUSTRY—APPARATUS FOR CEMENT TESTING.

I wish to obtain a book treating on the cement industry generally. Would also like to get a work on cement reservoir construction. I would also like to get the addresses of parties having on sale equipment for a small, inexpensive cement test laboratory, such as sieves, pans, scales, etc. If you will kindly give me the above information I will be very much obliged.

W. M., Bluefield, W. Va.

The "Directory of American Cement Industries" ($5) gives the fullest view of the cement industry, including descriptions of works and full information about manufacturers, dealers and users of cement and cement machinery and products.

Perhaps Buel and Hill's "Reinforced Concrete" ($5) and Taylor and Thompson's "Concrete, Plain and Reinforced" ($5) give the most information which can be applied to the construction of concrete reservoirs of any American books. Marsh's "Reinforced Concrete" ($7) is an English book, which describes methods of reservoir construction using reinforcement of steel in the concrete.

Tinius Olsen & Co., Philadelphia, Pa., sell the equipment for testing cement named.

WHERE TO GET INFORMATION ON COLORING CONCRETE AND MAKING SIDEWALKS.

I am at present interested in the manufacture of colored cement block or brick, and would wish some instruction in the manner of coloring same, or, in fact, anything pertaining to cement work. I would also like some instruction in regard to the making of monolithic sidewalks.

W. A. D., Oil City, Pa.

The "Handbook for Cement Users" ($3) and MUNICIPAL ENGINEERING ($2 a year) are the best sources of information on these subjects. The number for February, 1905, is particularly good upon them.

MAKERS OF REINFORCEMENT FOR CONCRETE.

I am thinking of bidding on a reinforced concrete bridge, and wish to know who makes the steel near this place. I would like also to get catalogues of this kind of bridges. J. K., Iola, Kans.

Reference may be made to the heading, "Fireproof Constructions," in the "Business Directory," published in each number of MUNICIPAL ENGINEERING, where the following names appear: Associated Expanded Metal Co., New York, N. Y.; R. S. Blome Co., Chicago, Ill.; Clinton Wire Cloth Co., Clinton, Mass., and St. Louis Expanded Metal Fireproof Co., St. Louis, Mo. Some names will be found under "Concrete Steel Arch Bridges," namely: Concrete Steel Engineering Co., New York, N. Y., and National Bridge Co., Indianapolis, Ind., to whom to apply for catalogues of reinforced bridges.

INFORMATION ABOUT CONCRETE BUILDING.

I desire to build several houses about three stories high, brick or concrete material preferred, everything with an eye to lessening danger by fire. Of course, that will have to include fireproof ceiling, flooring and roofing. In addition to this, I wish to be informed as to plumbing and heating.

Please advise me if you have any back numbers of your journal that will give me the desired information, and, if so, the cost of same. Also, kindly give me names of books or journals that it will be profitable for me to buy.

A. L. D., Macon, Ga.

A subscription to MUNICIPAL ENGINEERING ($2 a year), beginning with 1902, will be a good investment. Kidder's "Architect's Pocket Book" ($5); Gerhard's "House Drainage and Sanitary Plumbing" (50 cents); Wightwick's "Hints to Young Architects" ($2); Fullerton's "Architectural Examples" ($6); "Interior Woodwork of Houses" ($1); "Selected Details of Exterior and Interior Finish" ($2.50), are good books in teh various lines mentioned, as well as the "Handbook for Cement Users" ($5).

BOOKS ON CONCRETE BUILDING.

I am preparing to erect 162 houses of Portland cement. I am not a builder, but intend to let the contract to some one. Can you tell me where I can get a copy of a book called "Directory of Cement Industries" of contractors? Do you publish anything relative to cement or building or a construction journal?

J. H. R., Vandalia, Mo.

MUNICIPAL ENGINEERING Co. publishes the "Directory of American Cement Industries" ($5). It also publishes the "Handbook for Cement Users" ($3), which contains much valuable information about concrete building. MUNICIPAL ENGINEERING ($2 a year) reports from month to month the advances made in the art.

WHITE PORTLAND CEMENT.

We are desirous of obtaining the names of manufacturers who make a white cement, or as nearly white as possible.

N. Y. C. R., New York.

There is no white Portland cement on the market. We have a letter, as this number of MUNICIPAL ENGINEERING goes to press, from a prominent cement chemist, who states that he has found a deposit of material which makes a pure white cement which is equal to the best Portland cement. He wants to find cap-

ital to go into the manufacture of the cement for the market. There is much call for such a cement, which is partly met by the whitest brands of Portland cement, by some of the puzzolans, by Lafarge cement, by plaster, or by mixtures of these various cementing materials, according to the severity of the conditions, but a good pure white Portland cement would displace most of these makeshifts and it would soon develop a demand where there is now none, because none of the substitutes named will fully answer the purpose. Such a cement will command a price materially higher than ordinary Portland cement.

PATENTS ON SAND-LIME BRICK MANUFACTURE.

Will you please tell me through MUNICIPAL ENGINEERING if the process of curing sand-lime brick by steam pressure is patented, and, if so, who holds the Canadian right, and where I can get full information about their manufacture?

J. W. S. EDDY,
Regina, N. W. T.

The process of hardening sand-lime brick under steam pressure was invented by Dr. W. Michaelis and presented to the public, so that it is not now under the complete control of any one. There are several patents on special machinery for applying the process and upon modifications of it, and these patents are owned by the exploiters of the various systems now on the market. The company now having the largest number of its plants in operation is the H. Huennekes Co., using the Huennekes system. Full information regarding this system will be furnished on application to their offices, 114 Liberty street, New York City.

DEALERS IN FILTER SAND.

Will you kindly give me the addresses of three or four firms who have crushed quartz or filter sand for sale?

H. F. R., Decatur, Ill.

The St. Louis Crushed Quartz Co., St. Louis, Mo., may have a material which will be suitable for this purpose. Dealers in crushed granite nearest Decatur are: P. M. Bruner Granitoid Co., J. C. Finck Mineral Milling Co., Milne & Gordon, Schneider Granite Co. and Twen. Cen. Granite Co., St. Louis, Mo., and the Wisconsin granite dealers, such as the Amberg Granite Co., American Crushed Stone Co., Dolese & Shepherd Co., Western Consolidated Granite Co., Western Granite Co. of Chicago, Black River Granite Co., La Crosse, Wis., etc. We will publish names of other filter sand dealers if sent us for that purpose.

SPECIFICATIONS FOR BITULITHIC PAVEMENT.

Will you kindly inform me where I can find complete specifications for the construction of bitulithic pavement?

CHAS. R. BYRNE,
Waterbury, Conn.

The best place to get specifications is from Warren Brothers Co., 93 Federal street, Boston, Mass.

Descriptions of methods of construction and specifications in part may be found in MUNICIPAL ENGINEERING, vol. xxv, p. 325; xxiv, p. 115, and xxi, p. 40.

DUTIES OF CITY OFFICIALS IN MAKING ASSESSMENT ROLLS.

Who should obtain owners' names and descriptions of property for the making of assessments for the improvement of streets in Indiana cities of the fifth class, the city engineer or the city attorney?

H., ————, Ind.

Section 111 of the new cities and towns law makes it the duty of the board of public works to cause the assessment roll to be made out, and in the larger cities there is an assessment bureau for this purpose. Paragraph 53, Section 53, transfers the powers of the board of public works to the city council in cities of the fifth class. The section on city attorney seems to make it the duty of the city attorney to make the searches required, but the city council is superior to the city attorney and can have the assessment roll made out and the searches made at its discretion. The city engineer does not seem to have the duty unless it is assigned to him by the city council. Usually the city clerk, city engineer and the city commissioners, under the old law, have done most of the work, with occasional assistance from the city attorney.

DISPOSAL OF STORM WATERS.

This city made a contract for sewers, but they will not receive the surface rain waters. Now they want to put down pavements (asphalt or oil). What shall we do to convey the surface water on the paved streets and how make it cross the street crossings? The city has a lake near by, and the surface of the streets has a grade towards said lake.

SUBSCRIBER, Tam, Mexico.

In small cities and where the traffic is light gutters may be made across the streets, but these prevent rapid travel of any sort and are seldom permissible. The next step is to put in culverts, which are really gutters with rectangular cross-section and a cover on top, over which the travel passes. These gutters should be large enough to permit cleaning, or the tops should be in removable sections.

Where there is no frost, these culverts are very satisfactory.

If the area to be drained is large, the storm water will gather at some of these street crossings in too great volume for the capacity of the gutters, and if the streets are nearly level the water will spread out over the entire width of the streets. In such case, which is the usual case in a city as large as Mexico, it is necessary to put in storm water sewers, which may be as near the surface of the ground as is necessary and may be of any form and dimensions which will best perform the duty of carrying off the water as rapidly as it is discharged into them through catch basins located at the street corners and other convenient points. These storm sewers may be permitted to discharge wherever the street water has heretofore been permitted to run, whether stream or lake, as there should be no sewage in the street washings. The sanitary sewers must, in such case, carry away all the house drainage, and are sometimes designed to carry the first and dirtiest part of the street washings, the later and larger amounts of storm water, comparatively free from organic matter, being discharged through the storm sewers at a nearer outlet or into a stream or lake, without the purification which the house sewage must pass through before it can be discharged into the same body of water.

COST OF STONE CUTTING.

Can you send me a book that will give the cost of moldings, arches, etc., where Bedford or standstone is used?
R. M., Detroit, Mich.

The cost of stone cutting depends upon so many conditions that it can only be roughly estimated in advance, and the design to be cut, as well as the material and its age, must be fully known. Can our readers refer us to any source of information in print?

PAVEMENTS AND ROADS

Excess of Assessment Over Value—Lumber Trade Bureau—Newark Paving Contract—Motor Vehicles and Roads.

St. Louis Must Pay Excess of Assessment Over Value of Assessed Property.

Judge Kirby gave judgment to the Barber Asphalt Paving Company for $3,062 against the city of St. Louis recently. The Barber Asphalt Paving Company had originally brought suit against Henry B. Kilgour, of Chicago, to enforce collection of an apportionment warrant for that amount on property belonging to him on Von Borries avenue, between Rosewood and Edenside, and having a frontage of 555 feet on Von Borries avenue. The suit was for the defendant's portion of the expense of building a viaduct at that point. The defendant claimed that the assessment would be more than his ground was worth. The city was then made defendant, and the above judgment obtained. Mr. Kilgour will also have to pay $1,400 for the improvement of Edenside avenue, along which his land also lies.

Lumber Trade Section of U. S. Bureau of Forestry.

The bureau of forestry, at Washington, D. C., has created a new section to be called "Lumber Trade." Its purpose is to study the supply, transportation, markets, and the uses of lumber and other forest products. Special uses of wood for cooperage and boxes and for paving blocks will be carefully considered.

Newark's Mayor Refuses to Sign Paving Contract.

Chief Justice Gunmere granted a rule July 14 to show cause why Mayor Doremus, of Newark, N. J., and the board of works should not be compelled to sign the contracts with Warren Brothers Company for the paving of two streets. After the board of works had voted to award the contracts in question to Warren Brothers Company, Mayor Doremus refused to sign

them, claiming that it had come to his knowledge that a majority of the property owners affected had not signed in favor of bitulithic, as required in the case of a patented pavement. The matter rested there until June, when the board of works, acting on the advice of City Attorney McLear, gave notices of intention to pave the two streets in question with either granite block or brick, in place of the bitulithic. William B. Gourley, counsel for Warren Bros. Company, contended that the city had entered into a bona-fide contract with Warren Bros. Company, who acted in good faith. He also raised the point that the preference of the property owners was a matter for the courts to decide and not for the mayor. The mayor's counsel held that the mayor had a right to refuse to sign, and also that there was no valid contract with Warren Bros. Company. Argument will be heard at the November term of the Supreme Court.

Motor Vehicles and Roads.

The following editorial from the London *Surveyor* will be of interest. The question of the effect of motor vehicles on roads has not yet assumed prominence in this country, but observation has shown to a few the serious effects of speed upon the condition of roads, and the beneficial effects of motor cars at slow speeds, and it is but a question of time until the regulation of speed will become a matter of dollars and cents, which must be adjusted either by reduction of speed or increase of license fees to cover the extra work of repair made necessary by high speeds. American conditions on country roads thus far correspond with those produced by the lighter cars upon light roads as described in the following, and it is quite probable that the speed which is on the border line between benefit and injury to roads is not far from that stated, namely, fourteen miles an hour. This question will be heard from later with increasing interest. The following is extracted from the editorial referred to:

The very great diversity of opinions on the subject might at first sight seem unaccountable; but when it is remembered what a great many factors there are to be taken into consideration, it is easy to understand that in different counties the proportionate damage done by different classes of traffic must vary very largely indeed. Thus, on some roads heavy vehicles do the most damage, because the foundations of the roads are comparatively weak. The building up of the roads—as Mr. Moncur expressively calls it—must needs, under ordinary financial circumstances, be a slower process than the improvement of the surface. In this connection it may be noted that Mr. Bell finds, in Cumberland, that as a rule swift motor cars damage the roads as much as traction engines. Now, Mr. Bell makes his main roads, when possible, with a strong pitched foundation, a telford pavement, solidly formed and rolled before the metal is put on, and he favors the use of whinstone for the metaling. This may have something to do with the effects of traffic as he has observed them. Again, there is Mr. Vaughton's experience, that motor cars do not damage roads which have been properly consolidated by rolling, but do damage other roads, even at moderate speeds. If, as some surveyors think, the speed has considerable bearing upon the matter—the critical speed being about fourteen miles an hour—we have in this an important factor making for differences in the effects of motor cars on roads. In some districts the principal routes used by these vehicles may favor high speeds much more than is the case in other districts. Another important factor is the geological formation of the area under consideration in each case. In one county the motor car routes are almost confined, let us say, to a few very good main roads, and suffer little damage. In another county, situated near some great center of population, the less important roads have to take a share of the traffic. In one county or district heavy carts sally from numerous scattered farms, and then proceed along one main road through another county or district to the market. On the less important roads the nature of the binding material, as well as that of much of the metal itself, will depend upon the geological character of the district. Thus similar geological conditions may influence the rate of wear and tear much more in one county than in another. The weather is also an important factor. In some seasons, whether one is dealing with drought or with frost, most of the damage is done, or is led up to, by one extra long spell of bad conditions. Thus, of two neighboring counties, one may suffer more than another in the same season. Again, there are—apart from the main differences in methods of road-making—in the adjustments of surface conditions, little differences which have considerable effect upon the power of the road to resist certain kinds of damage. There are, indeed, so many reasons for divergences of opinion at the present stage of experience that it is hardly worth while pursuing the matter further, one report with all the conditions clearly defined being worth many answers to a single question. In the inquiry now un-

der consideration matters are very greatly complicated from the fact that—owing, we presume, to the want of definiteness in the question—it is not at all clear that differences in the kinds of effects produced by different classes of vehicles or differences in the amount of damage per vehicle, on the one hand, are distinguished from, on the other hand, actual amounts of damage done, or even mere increases in the total wear of roads, due to the "advent" of motor cars. If, as may well be the case, the general traffic is also increasing somewhat, as traders find the roads improve, there is still more reason why the cost of upkeep of roads should be increasing. At the same time, the effect of suction by the tires of swift motor cars, the spreading action of the rubber as the tire comes under the load, and the fact that the vehicle has driving wheels, imparting a horizontal thrust to the road surface, all have to be considered. On very narrow roads horses' hoofs make a rough track, but on a fairly wide road the effects of hoofs and wheels together result in a fair surface being maintainable with but little trouble. Dents are rolled out and incipient ruts and ridges of mud are beaten out. It used to be stated by motorists that, compared with horsed vehicles, the motor car improved the roads. This idea may now be said to be a fallacy; but we are inclined to think that on very good, hard roads what difference there may be in the amounts of damage done by the two classes of vehicles respectively is not a very serious matter. On lighter roads the motor car probably does comparatively more damage, chiefly because it fails to beat or roll down the surface in the way that ordinary traffic does. This does not apply to the same extent to the wheels of heavy motor cars, designed in accordance with local government board requirements; these vehicles have some rolling action, and, although the effect of their driving wheels cannot be as good as that of merely rolling wheels, we think that the local government board is well advised in adopting the principle of standard wheels and loads, to which, or to the eventual modifications thereof, the principal roads will gradually be made to conform. It is not, after all, a very high standard for roads of importance, and the heavy motor vehicle is in many respects preferable to the traction engine. Farm carts, when they come out of wet fields, and particularly when carting manure in the spring, often pick up the surfaces of the roads very much, and when a heavily laden motor wagon and trailer goes past it is easy to forget how many carts it replaces. It is true that if each of the carts just does not damage the road, and the one motor wagon just does, the number of the carts might as well be sixty as six, since "tear" is so much worse than wear on roads. But comparing the motor wagon with the traction engine, it almost looks as if the difference between their capabilities could always be expressed, in bad weather, in terms of the damage done by the traction engine.

SEWAGE PURIFICATION

Passaic Pollution—Contact Beds for Sewage Purification.

Passaic River Property Owners May Recover Damages for Pollution of Stream by Paterson.

The Court of Errors and Appeals, at Trenton, N. J., affirmed July 5 the decision of the Court of Chancery in the case of Henry M. Doremus and other riparian property owners along the Passaic River that they may recover damages from the city of Paterson for pollution of the river. The chancery court decision permitted the complainants to amend their case so as to bring action for damages without seeking an injunction. The chancery court had previously granted an injunction to the complainants from which the city of Paterson had appealed to the Court of Errors, and that tribunal had reversed the chancellor's decree. At that time the Court of Errors and Appeals established these propositions:

1. That the city of Paterson had legislative authority to construct its system of sewers, discharging their contents into the Passaic River, and it is not, therefore, subject to the charge of maintaining a public nuisance.

2. That the riparian owners on the Passaic River, above the point where the tide ebbs and flows, have title to the bed of the stream to the middle thereof, subject only to the right of the State to regulate navigation so far as the waters may be navigable, and that such riparian owners have a property right in the water flowing along and over their land.

3. That this property right can not be impaired except by lawful use of the waters by riparian owners higher up the stream.

4. That lower owners must submit to such pollution as results from the natural or reasonable use of the owners above, by the surface drainage or by the percolation of offensive matter through the soil, but that the higher owners can not lawfully combine and by constructing artificial conduits collect foul matter and pour it in mass into the stream.

5. That such a scheme, when put into operation, constitutes the taking of a private property, which the legislature can not authorize, except upon just compensation to the party injured.

6. That, ordinarily, where a riparian owner is injured by an unlawful diminution of the quality of water or by its excessive pollution, when his legal right is established, he is entitled to the exercise of the injunctive power of a court of equity.

7. That by reason of the great injury which would fall upon the city by restraining the continuous use of its sewerage system, and the acquiescence of these riparian owners above where the tide flows, their injury being comparatively small, it would be inequitable to grant them an injunction. Such injury, however, may be remedied by suit at law.

Following this decision the complainants amended their case in the Court of Chancery to fit the new conditions, and when Paterson appealed against that action to the Court of Errors it was affirmed, as stated above.

The Treatment of Crude Sewage in Triple Contact-Beds.*

By T. Hughes, Manager of Hampton-on-Thames Sewage Disposal Works.

The object of the paper is to place on record the results of six years' earnest endeavor to deal with crude sewage in "bacteria" or "contact beds," without any preliminary treatment whatever, or any separation beyond the removal of those matters arrested on a half-inch mesh screen.

The author has some degree of satisfaction in asserting that though Hampton may not have the honor of being the first district to install this method of treatment, originated by Mr. W. J. Dibdin, yet she undoubtedly has the well-merited distinction of having carried it out more completely, and of having persevered with it more thoroughly and for a longer period of time than has any other place.

When the treatment was initiated, it was confidently asserted and implicitly believed that the solids of sewage would all be "eaten up by the organisms," that the sludge bugbear would be "annihilated by the myriads of micro-organisms present in the sewage," and "that the area would be sufficient for the complete disposal of the sludge, without any expense for labor other than that necessary for turning on the valves and raking over or digging with a fork the surface of the material from time to time, as may be required to break up the surface coating of fibrous matter."

The beds were designed in 1898 to treat 210,000 gallons of sewage daily, from a population of 7,000 persons, allowing 30 gallons per head.

The beds are fifteen in number, arranged in three terraces, five beds in each terrace. The beds in the first terrace are 50 feet long by 34 feet 6 inches wide, those in the second 55 feet long by 35 feet wide, and those in the third 60 feet long by 35 feet wide. All of them have an average depth of 4 feet, with a free outlet, the drainage channels being formed in the concrete floor of the beds. The material used, boiler furnace clinker, was obtained from the water works, and was delivered in the condition it was in when removed from the furnaces; that is to say, without screening. At the sewage works it was sifted into three grades, one for each set of beds. The primary beds were filled with material of three-quarter-inch and upwards, the secondary with one-quarter-inch to three-quarter-inch, and the tertiary with the residue, including the dust. The liquid capacity of each of the beds when filled with material was estimated to be 20,000 gallons. For the purpose of evenly distributing the sewage on to the surface of the beds a series of half pipes were arranged in three longitudinal main channels, 12 inches wide, one opposite to each of the openings into the beds, and in cross channels, 6 inches wide and 2 feet apart, leading from and connecting together the main channels. All the channels were laid so that the top of them was level with the surface of the material. In November, 1898, when the author was appointed manager of the works, only two beds in each tier were ready for use, and, anticipating the likelihood of solid matters collecting in the channels of the primary beds, he suggested that very shallow troughs should be used in the remaining primary beds.

The first house connection was made on December 8, 1898, but sewage did not reach the works until towards the end of the month.

In January, 1899, the quantity of sewage, including a small amount of leakage from the subsoil of about 16,000 gallons in the twenty-four hours, amounted to about one bed per day. This was allowed

*From a paper before the British Association of Managers of Sewage Disposal Works.

to accumulate in the sewers until the forenoon, when the whole would be dumped in about one and a quarter hours.

In May, owing to the rapidity with which connections were being made, pumping had to be resorted to twice a day, and then for a longer period.

As the volume increased, sludge, mixed with a good deal of paper which had passed through the screen, began to accumulate on the surface of the primary beds, and where it accumulated it prevented the sewage from entering the bed. In order to keep this paper out of the beds a small screen, having one-quarter-inch openings with one-quarter-inch bars, was fixed in the channel close to the screening chamber, which arrested a large quantity of the paper, and though it necessitated cleaning very frequently, yet it prevented the surface from clogging so rapidly as it had formerly done.

It now became clear that the channels of the primary beds were, in reality, receptacles for sludge. The matters which settled in them after filling the bed lay there until the next filling, when they would be forced over the sides of the channels on to the bed by the inflowing sewage, and would be replaced by the fresh sludge of that sewage. Gradually the sludge spread from the channels over the entire surface of the beds, until one of the beds could not be filled at all, the liquid remaining on the surface for hours. It became necessary, therefore, to clean the surface of this bed. In order to do this the bed was allowed to rest for three days, to dry the sludge; then the dried sludge was picked up with forks, put into barrows, and wheeled away. The author was informed that this might have been avoided by digging the sludge into the bed, but he protested against this view on the ground that, as it had already rendered the surface impervious, so would it any lower strata to which it might be transferred, when the subsequent removal would be more laborious. The operation caused some of the material to be broken up, and the surface to become uneven, owing to the trampling about in removing the sludge, which necessitated the relaying of the channels. On taking the half pipes up it was found that the material upon which they rested, for some depth, and in the immediate neighborhood, was absolutely solid; neither liquid nor air could possibly circulate. Seeing this condition, the author decided to adopt the method of distribution he had previously suggested, not only on this bed, but on the others which had in the meantime been got ready. He placed shallow wooden troughs along the full length of the bed, forming three channels, one opposite to each of the inlet openings. These troughs were raised about three inches above the surface of the beds, so that the air could get underneath, and, being shallow, the liquid and sludge would more freely pass over the sides. The transverse channels were done away with. The troughs could be used to walk upon and any subsequent removal of sludge would be more easily effected. After the beds had been in work about six months some very black deposit was noticed coming out of the primary beds, when the valves were first opened to let out the liquid, and also when these beds were draining. This was, at the time, thought to be due to the way the drainage channels were formed, and to the absence of material from them. The fourth and fifth primary beds were altered, the channels were filled with material, and several rows of 4-inch pipes were placed vertically and horizontally in the beds for aerating purposes. This prevented the black deposit from coming out, but the drainage was slower, and after a time it was found that the beds were losing their liquid capacity, so it was decided to take the material out of the channels and to revert to the old method of drainage. When this was being done the material in the beds was sifted by an inch mesh sieve, in order to take out the small material caused by disintegration.

On October 10, 1899, Mr. Charles E. Cassal, F. I. C., public analyst for Kensington, who had been instructed by the urban district council to inspect and report upon the system of sewage disposal, certified that "the results attained are remarkably satisfactory." The report shows that the percentage purification in oxygen absorption and organic ammonia was 96.9 and 97.5, respectively. It refers to the raw sewage as a "strong town sewage of very offensive character." The strength was evidenced by its absorbing 12.9 parts of oxygen, and containing 1.52 parts of organic ammonia per 100,000 parts. The "very offensive character" could, at all times, be noticed at the screening chamber, where the sewage emerged from out of the rising main, and will be understood when it is known that this sealed main has a capacity of over 60,000 gallons, and that the quantity dealt with, at the time, was estimated to be 70,000 gallons, so that the sewage had been in this main, out of contact with the atmosphere, and undergoing septic action, for about twenty-one hours. Owing to this action, and to the amount of agitation to which the sewage was subjected in passing through the ejectors, scarcely any solid fœcal matters reached the works; the paper, even, was commonly in very small pieces, and a considerable

quantity passed through the screen on to the beds. There is no doubt that this amount of septic action had a beneficial influence upon the subsequent treatment, and there is equally no doubt but that the additional quantity of paper, etc., which passed through the screen was a disadvantage in so far as the clogging of the surface was concerned. The report also refers to the "effluent after passing through land," and states that "such evidence as is now available goes to show that, at present, the effluent becomes deteriorated by being passed through the land." But the condition of the land through which the effluent has to pass should always be taken into consideration, and in this case, a fact, overlooked at the time, but which has since been brought to remembrance, shows that a portion of the area through which the effluent passed had been used, within a short period prior thereto, to trench house refuse in. It is necessary to state this, as a leading work on sewage purification quotes Hampton as an illustration where "an originally good effluent suffers great deterioration by subsequent passage through land."

In July, 1900, one of the primary beds (No. 2) was gauged for loss of capacity. This was done by filling the bed by means of a 500-gallon ejector, and counting the number of times it discharged. Judging by this method of gauging, the amount of loss was small. Several other primary beds were similarly gauged on later dates up to February 1, 1901, and in every case we were satisfied that the loss of capacity was not great.

The author, however, considered that some means should be provided to prevent so much suspended matter from going on to the beds, and he suggested to Mr. Kemp, the surveyor to the council, that the primary bed nearest to the screening chamber should be used as a settling tank, by taking out the material, raising the wall eighteen inches and constructing a division wall down the full length of the middle of the tank, but lower at the farther end. The sewage would be directed into the first half of the tank by blocking the main channel, flow through the full length of the tank, over the lowered wall at the end, and return through the other half back into the main channel. The deposited sludge could be discharged through valves on to the land by the hydraulic head in the tank. Although Mr. Kemp admitted that some provision would have to be made, he did not give his sanction to this alteration, which, in the author's opinion, would have got rid of the sludge at a considerably reduced cost, while keeping the beds in a much better condition. However, as something had to be done, the author obtained Mr. Kemp's sanction to an alternative plan, which was to lower the surface of each of the primary beds at the inlet end, so as to be nine inches below the general surface, and extending forward about a quarter of the length of the beds. The bay thus formed was to be used as a kind of settling tank; its surface was covered over with fine material, so that the deposit could be easily picked up with a shovel and removed. It was not intended to collect the whole of the suspended matter, but to arrest the coarser and heavier particles. The fine matters could not deposit in the bays, owing to the disturbance caused by the inflow of the sewage, but would be carried on to the general surface of the beds, and would necessitate being periodically removed. Previous to carrying out this arrangement the wooden troughs were taken away, and the top nine inches of all the primary beds were sifted and made up with fresh material. Even after adopting this means of preventing so much clogging of the surface of the beds, the author still advocated the putting down of a tank, in order to remove the suspended matter from the sewage before putting it on to the beds.

In September, 1900, the author was instructed to determine whether the sewage could be sufficiently purified by two contacts instead of three, if fine material were used in the second contact. With this object, he removed twelve inches from the surface of the middle secondary bed, and replaced it by the same kind of material which was in the tertiary beds. The result was disappointing; the effluent from the bed was not nearly so good as that from the other beds in the same series, and after passing the effluent from this bed through the tertiary beds no appreciable benefit resulted. The bed remained in use in this form for some time, but the effluent got gradually worse, and, notwithstanding the fact that it was passed through the third contact beds, it became necessary to put it on the land. The author then decided to remove the fine material from one-half the bed and to replace it with material of the same size as that formerly taken away. This improved the effluent considerably, and eventually the bed was put in its original condition. After this had been done the effluent was equal to that of the other beds in the same series. The author considers that this proved definitely that the bad result was due to insufficient aeration, caused by the fine material on the surface of the bed.

In 1901 the accumulation of sludge in the bays was removed at an average rate of three bays per week, about 32 cwt. on each occasion, and that on the surface

of each of the primary beds was cleaned off every three months. There can be no doubt that the adoption of bays had relieved the work on the surface of the beds considerably. A large quantity of the black suspended matter, previously referred to, came out of the primary beds, especially when these beds were draining, and in order to try to prevent this from going on to the secondary beds, boards were fitted in the openings to all the beds. These boards were three inches deep, forming a weir, so that there would always be a depth of three inches of liquid left in the channel. The deposit collected by this means was swept out each morning and removed into pits dug out in the field, which pits were occasionally cleaned out after draining.

In 1902 the sludge accumulating in the bays was removed at an average rate of six bays per week; that is to say, one bay was cleaned every day, excepting Sunday. The surfaces of the primary beds were cleaned and forked over every three months, and eleven surfaces of the tertiary beds were also cleaned and forked over.

In June of this year it was deemed advisable to commence night work in order to stop the nightly accumulation of sewage in the gravitating sewers, and so as to more evenly distribute the flow on the beds, on account of the time required for the treatment. The practical necessity for this step is seen from the condition existing in the previous month, when the amount of sewage collecting in the sewers during the night was more than sufficient to fill all the beds in two and a half hours' pumping in the morning. The surplus had to wait until sufficient aeration had taken place in the bed first filled, which would not have occurred before 1 p. m. at the earliest. Again, the number of fillings per day was on an average ten, or, as only four beds were in use, at the rate of 2.5 for the ten hours, equal to five fillings in the twenty-four hours. An additional disadvantage was the interruption of the work in connection with the sewage, which filled the beds towards the end of the day. The author is of the opinion that sewage should not be allowed to accumulate in the sewers in any case. These should always have a free flow of sewage in and a free circulation of air through them.

In 1903 the bays were cleaned every week day, and the surfaces of the primary beds were cleaned and forked over every two months, and nineteen tertiary bed surfaces were also cleaned and forked over. In addition, the stoneware channels on the surfaces of the secondary beds, which previously had only required cleaning once and then twice a week, now required cleaning every second day. The sludge collected from them was wheeled on to the sludge lagoon.

In order to estimate the quantity removed from these channels the sludge from them was, for a period of forty-two days, March 12 to April 22, inclusive, placed in a prepared bay, the sides of which were made up with ashes, in order to allow the liquid to drain away. When it had sufficiently drained it was measured, and amounted to 161.3 cubic feet, or 3.84 cubic feet per day, equal to 14.22 cubic feet per 1,000,000 gallons. It was then in such a condition that it resembled jelly, and could be dug with a shovel. In its original wet state it was equal to 62.3 cubic feet, or 1.44 tons per 1,000,000 gallons of sewage.

This year was a record one for sewage works managers, inasmuch as it was an exceptionally wet year, increasing the volume of sewage enormously at all sewage works. The total rainfall for the year, as taken from the rain gauge at the works, was 33.15 inches, the wettest month being June, with 6.39 inches, the dryest being February, with 0.96 inch.

The working of the beds during the months of June, July and August was difficult. During these months only three primary beds were in use; not the same three beds, but only three of this series were available at any one time, because one bed was standing empty for the purpose of removing the sludge from its bay, and the other was having its surface cleaned.

The average number of fillings was 19.94 per day. The average daily flow of sewage was 285,142 gallons. The area of the three primary beds was 585.6 square yards. The average daily rate of infiltration through these beds was therefore 487 gallons per square yard, equal to 2,357,000 gallons per acre.

On June 18 the three beds were each filled twelve times in the twenty-four hours, the rate of infiltration being 879.1 gallons per square yard, equal to 4,254,800 gallons per acre.

On June 20 and 21 the flow was so great that the only way in which it could be dealt with was by allowing it to pass through the beds continuously. As no record of fillings could be kept, these two days were regarded as average days in the calculation for the year.

It has been stated above that the average daily rate of infiltration through the first contact beds was equal to 2,357,000 gallons per acre, and it follows that the sewage must flow through the second and third contact beds at this rate, if the areas of these beds were equal to that of the first beds. It is, however, customary in estimating the quantity of

sewage treated to disregard the rate of filtration and the number of contacts, and to refer the volume to the area as a whole. The author contends that this is scarcely fair to sewage works managers, and that, from a practical point of view, the rate of infiltration should at all times be expressed, rather than the ratio of the volume to the entire treatment area.

Working the primary beds at this rate caused an enormous quantity of suspended matter to wash out of them, and despite every effort made to prevent it from entering the secondary beds, the rate of clogging of these beds was such that by September the loss of capacity was as much as 60 per cent. of the original. This compelled the author to remove and to wash the whole of the material in them. A temporary washer was rigged up, and the operation of washing the material in No. 5 secondary bed was commenced on September 3, and the bed was in use again on November 2. The cost of washing, making up the amount lost with new material, which was already prepared, and relaying the channels, was at the rate of 1s. 6 1-2d. per cubic yard. With proper appliances, I think, the kind of material used in the second contact beds could be washed for 1s. per cubic yard. The cost is for labor only, no allowance being made for water or air used for washing. In this case the final effluent was used, the quantity required being pumped by a small Worthington pump and afterwards discharged on the land.

In 1904 the bays were cleaned every working day, the surfaces of the primary beds were cleaned and forked over every six weeks, the collection in the channels on the surfaces of the secondary beds was swept out every other day, and forty-three tertiary bed surfaces were cleaned and forked over.

In connection with the tertiary beds, it ought to be stated that the whole of the material in these beds had, at different times, been turned over once, in three beds twice. The operation consisted in taking away five inches of the surface material, and in loosening and rearranging the remainder in the following way: The material abutting on the inlet end of the bed for a distance of four feet, and across the full width of the bed, was dug out and placed in a heap at the outlet end of the bed. The bottom of the bed thus exposed was loosened. Then a similar adjoining area was dug out, the surface foot being removed to the heap already mentioned, and the remainder being put into the space first made, which was completed by the surface foot of the third area. The remaining part of the third area was placed in the second space, which, in its turn, was completed by the surface foot of the fourth area, and so on until the whole bed had been turned over. In this way the surface material which contained the greatest amount of deposit was kept on the surface. The bed was made up by fresh material, suitably graded.

As no exact record of the quantity removed from the screening chamber had been made, it was determined to ascertain by careful measurement the daily amounts for a period of one week, April 22 to April 28, inclusive, which were as follows:

TABLE I.

MATERIAL REMOVED FROM THE SCREENING CHAMBER.

	Cubic feet.
April 22	3.5
April 23	3.8
April 24	3.9
April 25	4.1
April 26	3.7
April 27	3.7
April 28	4.1
Cleanings from the chambers, as is the custom once a week	4.1
Total	30.9

The quantity of sewage which had passed through the screen during the period was 1,784,160 gallons, so that the screenings were removed at the rate of 17.6 cubic feet, or 0.387 tons per 1,000,000 gallons of sewage. It was also thought desirable to find out what proportion of sludge the sewage contained. In order to determine this, on April 13 1,438 gallons of fair average sewage were allowed to settle for four hours; then the liquid was syphoned off. The resulting thin sludge was transferred to a small tank for further sedimentation. At the end of twenty-four hours the remaining quantity of liquid was carefully syphoned off, when the sludge was found to measure 9.2543 gallons, equal to 1 in 155 of sewage. The observation was repeated on two subsequent occasions, when the proportions were 1 in 84 and 1 in 234, the average of three observations being 1 in 157. In each case the sludge contained 93 per cent. of liquid.

From the chemical analyses the sewage contains, on an average, 1 of sludge having 90 per cent. of liquid in 200 of sewage. This is equal to 22.3 tons of sludge per 1,000,000 gallons of sewage.

From April onwards the sewage and effluents have been regularly submitted to analysis, which shows that the average percentage purification in albuminoid nitrogen and oxygen absorption was 89.2 and 88.3 for the period stated.

The total amount of sewage dealt with during the six years was 324,850,000 gallons, which involved 22,094 fillings of the primary beds. To state the exact amount of suspended matters which, as sludge, etc., had been removed during that period

would be impossible. For instance, the amount removed from the interior of the beds might be thought to be capable of estimation by the loss of capacity in the beds, but taking into consideration the disintegration and settlement of the materials, the growth of the organisms and the amount of liquid held up by them, it is a calculation so beset with difficulties that the author has avoided entering upon it. However, that which has been capable of being weighed and measured has been repeatedly and with considerable care and exactness submitted to such processes, with the following results:

TABLE II.

TONS OF SLUDGE, ETC., PER ONE MILLION GALLONS OF SEWAGE.

Quantity removed from the screening chamber	0.387
Quantity removed from the bays	5.000
Quantity removed from the surface of the first contact bed	1.250
Quantity removed from the channels of the second contact bed	1.440
Quantity removed from the surface of the third contact bed	1.390
Total	9.467

All the items in the above table have reference to material which had been allowed to drain for at least twenty-four hours before being removed by shovels and forks, with the exception of that removed from the channels of the secondary beds, which was flowing sludge, containing about 90 per cent. of liquid. If the whole had been expressed as ordinary sludge, then the tonnage would have been greater.

In venturing to discuss the vexed question of the treatment of sewage, more especially in having the hardihood to enter upon a forecast, the author knows that he is approaching dangerous ground. That it is not altogether forbidden, and that his action is not without precedent, is evidenced by the numerous papers which have been read, describing, in one way or another, the solution of the sewage treatment problem.

It is, at any rate, not for sewage works managers, who have devoted several years of daily study to the question, who have hourly watched the various processes, and who have thought, talked and lived in the midst of sewage, to remain silent, to permit the results of their labors to be quoted, and often misquoted, and to see methods of treatment advocated and installed which, had they been a little more communicative, would have failed in initiation rather than in actual operation.

This is the excuse, if excuse be needed, for the following forecast:

Our experience has proved, and our experiments have abundantly confirmed the observation, that all methods of sewage treatment which place reliance upon the liquefaction of the solids of sewage, even of the organic solids, for the success of the process will fail, and in proportion to the dependence upon such action so will the degree of failure be. In other words, to resolve all, or even more than a moderately small proportion of the organic solids of sewage, is impossible, within the limits of a practicable scheme. The remainder will either outflow from or remain in or on the treatment area, and will require removal therefrom.

The principle of spreading these matters over a large surface, and in the interstices of material and of having to follow them over this surface, and among the material for the purposes of collection, is neither sanitary nor economical. The statement that by such means the organic solids are all destroyed without nuisance errs only in two particulars, viz., they are not all destroyed, and there is a nuisance.

The gases, which are the cause of the offense, and at the same time the chief index of the activity of the organisms, are not lessened in actual amount by extending the surface area, but are more largely diluted and less obvious to the senses by being brought into contact with an extended atmospheric covering.

The assumption which has been made that dead organic nitrogenous matters are destroyed in this way, without putrefaction, requires only to be stated in order to be refuted. It contravenes the natural law relating to the resolution of such matters, which enacts that all such substances must undergo putrefactive decomposition before being submitted to oxidation processes and being capable of further utilization.

That the solids in suspension can be removed from the sewage, more or less completely, by precipitation and by settlement in septic or other tanks is a fact well known. There is, however, a considerable proportion of the remaining organic matter, in a condition of pseudo-solution, which is incapable of being deposited from the sewage, in any hollow chamber, within a reasonable limit of time, and yet will deposit upon any material with which it may come into intimate contact. This organic matter, of a colloidal nature, has hitherto been neglected in the literature of the subject as in the practice, but it has formed the subject matter of our research in the laboratory for some time past, and will play an important part in the questions relating to sewage treatment in the future. Attention has also been drawn to it by

Dr. G. J. Fowler, of Manchester, in a paper read before the Society of Chemical Industry on April 7, 1905.

In conclusion, the author ventures to predict that the ingenuity of future workers will be devoted to perfecting the means for the removal from the sewage of these several matters, solids in suspension and solids in emulsion, and with them the "objectionable bacteria," which will all be committed to the land for burial or to the fire to be consumed.

WATER AND LIGHT

Chicago's Supply—Brooklyn Hydrant Contract—Buchanan's Water Power—Chicago Water Rates—The Tantalum Lamp—Cost of Detroit Lighting.

Chicago Grows Faster Than Its Water Supply.

In a report to Joseph Patterson, Commissioner of Public Works at Chicago, City Engineer Ericson says an ideal water system is impossible in a city with a growing population. In commenting on the report the Health Department Bulletin says:

The water works system, at the present rate of consumption, is sufficient for less than 1,850,000 population, while the present population is about 2,000,000. Improvements and additions now authorized and under way and the cost of which will be about $4,370,000, will not be fully completed until 1909. The total nominal daily capacity of the system will then be 687,000,000 gallons, which, allowing for proper reserve, will be barely sufficient for a population of 2,370,000, the estimated population in 1909 being about 2,400,000.

Brooklyn Official Restrained from Contracting With Highest Bidder.

Justice Kelly, of the New York Supreme Court, handed down a decision July 12 permanently restraining Water Commissioner Oakley from awarding a contract for water hydrants to the A. P. Smith Mfg. Co., of Newark, N. J. The decision is the result of a suit instituted some time ago. The contract in question called for high pressure hydrants to be installed in Brooklyn in connection with the new salt-water fire system. Both of the above firms, as well as other manufacturers, were bidders. The Kennedy Valve Co. was the lowest bidder, submitting an estimate that was $16,575 less than the A. P. Smith Mfg. Company, which was the highest bidder among them. Claiming that the hydrant of the A. P. Smith Co. was far better in every way than any of the others offered, Water Commissioner Oakley awarded the contract to that firm. The result of the permanent injunction granted by the Supreme Court will be to compel the water department to call for new bids or award the contract to the Kennedy Valve Co.

Buchanan's Water Power Can be Transmitted Elsewhere.

A decision was handed down in the Circuit Court at Grand Rapids, Mich., July 15 by Judge Alfred Wolcott, in the water power dam litigation of the village of Buchanan, Mich., against Charles Chapin. Judge Wolcott refused the petition of the vilage for an injunction restraining Chapin from transmitting power outside of the village. He held that the village had no power to make such a contract as was the basis for the suit, and that the complaint failed to show irreparable damage because of the transmission of power to South Bend by Mr. Chapin's plant. The case involved the loss of a sum amounting to $300,000 on the part of the defendant. The village of Buchanan secured permission in 1891 to dam the St. Joseph river for water power purposes, and $50,000 was raised. The contract was let to English, who was to construct the dam and water works, and, after its completion, was to have the title to the dam. One of the conditions to the contract was that neither he nor any of his heirs or assignees should transmit power derived from the Buchanan water outside of the village. Several transfers, finally to the Buchanan Power & Electric Co., followed. The company became insolvent and then the defendant, in the suit just completed, came into possession, paying $100,000. He spent over $225,000

additional, and at present the plant has a maximum capacity of 4,000 horse power. But 180 horse power is used in Buchanan and the remainder is transmitted to South Bend, Ind. The suit was begun for the purpose of preventing Mr. Chapin sending the power out of Buchanan.

Water Rates of Private Companies in Chicago Sustained.

In a report to Judge P. S. Grosscup July 18, Master in Chancery E. B. Sherman declared that the city council of Chicago passed two ordinances governing the rates to be charged for the supplying of water by the Chicago Suburban Water & Light Company without inquiry or investigation into the conditions, and that the result was a hardship on the company. Judge Grosscup, with this report as a basis, ordered that the restraining order issued by him against the city some time ago restraining the enforcement of the ordinances be made perpetual. The Cicero Water, Gas & Electric Light Company was organized August 27, 1887, to supply water, gas and electric light to residents of Cicero and Austin. Later the Chicago Suburban Water & Light Company purchased the assets of the original company. In 1899 part of Cicero and Austin were annexed to Chicago, and it was declared in the original bill of complaint that under the statute of annexation all contracts made by the water and light company were to be preserved. In April, 1901, the city council passed an ordinance making the water rates uniform with those in Chicago, and the following year the water company filed its bill of complaint against the city, and a temporary restraining order was issued.

The Tantalum Incandescent Lamp.*

By Dr. Louis Bell.

The writer was lucky enough to receive, through the courtesy of Mr. E. D. Adams, ten 25 Hefner 110-volt Tantalum lamps. These were, with the kind assistance of Prof. Puffer, put through various tests, and in particular two of them were given a decay test with the rather startling results recently published in a joint paper. The upshot of the matter was that these two lamps, selected as being about the average of the lot in performance, gave a life of some 850 hours before falling below 80 per cent. of their initial candle power, and were both burning at 16.6 c. p. at the end of 1,190 hours, although one of them had at some unknown time in the previous three days run broken a filament close to one of the spider arms and had automatically mended itself by the fall of the loose end across the other side of the same loop, where it welded itself firmly into place and went on burning.

These two lamps ran 800 hours of their life at a mean horizontal candle power of 20 and at about 2.05 watts per candle, thus giving 16,000 candle hours of useful life at this extremely high efficiency. On a rating of 2 watts per candle average, the lamps were good for 600 hours, giving over 12,000 candle hours. On a rating of 1,000 hours they gave nearly 19,000 candle hours at a mean energy consumption of, say, 2.15 watts per mean horizontal candle. The circuit on which the run was made was on the average fully up to the rated 110 volts, although the pressure varied somewhat irregularly, perhaps a couple of volts on each side of this figure.

The light of the Tantalum lamp is, as might be expected from its high efficiency, rather whiter than that of an ordinary incandescent, being as white as the Nernst lamp or the acetylene flame. Its distribution of light is, in the present form of filament, rather less uniform than that of the common incandescent, being relatively more powerful in a horizontal zone and less powerful for points near the axis. The ratio of mean spherical to mean horizontal candle power, as found in Prof. Kennelly's investigation of the frosted lamps, proved to be .73, and the writer's figure from the clear lamps was substantially the same. The distribution, however, could very easily be improved so that the spherical reduction factor would not differ materially from the usual figures, and the light at the top would be correspondingly increased.

Since the Tantalum filament has a low initial resistance (between 55 and 60 ohms) it jumps into incandescence with startling rapidity as compared with a carbon filament, but because of its positive temperature coefficient it seems to be decidedly less sensitive to changes of voltage in its working condition. This is a useful property in certain respects. The fact, however, that the initial resistance of the Tantalum is so low and its thermal inertia so small, owing to its small mass and low specific heat, means rather violent heating up, which is probably the cause of some doubts which have been expressed as to the endurance of these lamps upon alternating circuits. It is not difficult to imagine pretty severe strains upon the filament if it had time to cool down much between impulses. If such cooling could take place, for instance, on an ordinary alternating circuit, the results might be serious.

Some stroboscopic tests were therefore made at the last moment to determine whether at, say, 25, there was a specially

*A paper before the National Electric Light Association.

violent fluctuation of light from the Tantalum lamp; in other words, to find out whether on a 25-current the filament had time to cool down materially. The result showed that the light fluctuation at this frequency was somewhat but not much more pronounced than in a carbon filament. The Tantalum lamp behaved, in fact, about like a 10 c. p. carbon filament lamp. Even a 75 c. p. carbon filament lamp, however, shows perceptible variation under this test. At 60 c. p. the fluctuation, while still perceptible, was trivial both in the Tantalum and carbon lamps. It hardly seems probable that at 60 c. p. the life of the Tantalum should be enough impaired to cause serious trouble, but the writer now has some lamps on alternating current tests and proposes to pursue the inquiry.

The Tantalum filament seems to stretch and sag at first, as if undergoing annealing and losing the set produced by drawing. Then it shows local bright spots, which grow lumpy, as if the material tended to flow a little from the heat, and with the increasing lumpiness the filament draws up tight. At this stage it is rather fragile, and would probably break easily from vibration or shock. It seems likely that the final break comes just where one of the lumps has reduced the cross-section of the wire beside it. The break in the lamp during test, already referred to, showed considerable attenuation of the loose end.

The lamps, as tested, showed the following characteristics:

Lamp.	Watts.	C. P.	Watts per candle.
Clear Globes.....	41.58	21.42	1.94
	38.61	20.90	1.84
	41.58	24.93	1.66
	41.58	21.55	1.93
	41.91	21.81	1.92
	41.91	22.59	1.85
Frosted Globes...	40.36	19.79	2.03
	40.34	18.54	2.15
	40.04	18.74	2.13
	40.48	19.27	2.09

The mean result from the clear globes was 22.2 c. p. at 1.85 watts per candle power, and that from the frosted globes 19.08 c. p. at 2.1 watts per candle power.

It is interesting to note that the clear lamp gives just about 1 c. p. per inch of incandescent filament, which implies an intrinsic brilliancy of somewhere about 500 c. p. per square inch of filament—a figure much higher than in the ordinary incandescent.

As illuminants the lamps are certainly very excellent, but their introduction raises some most interesting questions for the central station operator.

Putting aside all the petty questions that will be raised about the new lamps for commercial reasons, the broad fact remains that we are here dealing with a bona fide 2-watt lamp having a life fairly comparable with the carbon filament lamps now customarily in use. Moreover, it is a competitor of these, socket by socket, and not as a substitute with particular requirements, as in the case of the Nernst lamp or the very small arcs. There is some doubt as to the life of the Tantalum lamp when exposed to unusual vibration, which may perhaps bar it in some special locations, but for the everyday work of the central station there is good reason to believe it generally applicable.

Its price can hardly be said to be fixed in this country, but abroad in Berlin it is about $1, which will give at least a fair line on its commercial results. On this basis, and with current at 10 cents per kilowatt hour, one finds, taking the new lamp on its 600-hour rating, that the cost of its 12,000 candle hours, including the lamp, amounts to $3.40. The same number of candle hours from a lamp giving a mean efficiency of 3.25 watts per candle would cost $3.90, exclusive of lamps, i. e., the consumer could afford to pay $1 for the new lamp better than to take the old ones free. With current as low as 5 cents per kilowatt hour, the user of Tantalum lamps could only afford to pay 75 cents per lamp as against getting carbon lamps free. That means that a sliding scale of discounts for lamps according to quantity could be made to catch the consumer at all prices ordinarily charged for current by central stations. Does this mean that the carbon lamp will shortly be down and out? Probably not, for there is no spur like competition to start up improvements, and there are some signs that carbon lamps may be improved enough in efficiency to make things interesting, at least with current at the prices charged to very large consumers. This, however, remains to be seen, and the thing which the central man has to meet is the immediate probability of consumers putting upon their circuits lamps taking less than two-thirds the energy per candle power of the best lamps now in use and thereby cutting down their meter bills enormously. Now, broadly, what shall be the attitude of the central station man toward this income-scalping innovation? There are some managers who may be inclined to put up a fight to discourage the user, either by raising pettifogging objections or by trying to discriminate against 2-watt lamps by readjusting discounts in various ingenious ways. The writer is very strongly of the opinion that such a policy is wrong, and will certainly lead to ultimate disaster in the form of munici-

pal restrictions or regulations of rates by law. In the long run, opposition to improvements does not pay. If, on the other hand, the central station man hangs quietly on and gives the consumer the glad hand, the change will work to his ultimate benefit. In the first place, the Tantalum lamps now made are of 22 c. p. instead of 16, and the filament will hardly bear much reduction in cross-section. The tendency, therefore, will be to use these slightly more powerful lamps, taking, say, 42 watts instead of a trifle over 50 watts in the 16 c. p. carbon lamps. The actual loss in energy sold is likely therefore to be, for the present, quite a little less than the difference of efficiency would indicate.

Besides this, the attraction of cheaper light will certainly bring into line new consumers, so that the net result will probably be an actual increase in sales of current, quite a little of it being among the smaller consumers, who pay the higher rates. Such a change means, upon the whole, more lights connected per unit of capacity in transformers or feeders, and hence a slightly better utilization of material and improved load. In the case of stations with underground service, the change to 2-watt lamps ought to bring with it increased earnings per unit of cable capacity. The fact is that improvements in the efficiency of utilization of electric energy help the business, and it is both fruitless and inadvisable to oppose them for any short-sighted notion of small temporary savings.

I have here said nothing regarding the inevitable competition between present lamps and the newcomer. In the first place, the merits of the final issue remain to be determined, and, in the second place, competition in lamps is, on the whole, a good thing for the user of them, however it turns out. So far as the central station is concerned, it is a case of dog eat dog.

The really important thing is that from now on the station manager will have to deal directly with the 2-watt lamp proposition, for there is no disguising the fact that it is here, and in a form that is quite unexpected. The appearance of Tantalum lamps in quantity may be a little delayed in this country, but delay will improve them, as in the case of every new product, and will serve to assure a better understanding of their truly remarkable properties and of their possible limitations. The unexpected has certainly happened, for most engineers had long ago abandoned the idea of a lamp with a metallic filament. Only the discovery of a metal virtually new, and possessed of the most sensational qualities, could have brought about the present striking result.

Cost of Street Lighting in Detroit.

The annual report of the public lighting commission of Detroit, Mich., has been submitted by Frank T. Bowler, secretary of the commission. It shows a reduction of $5.17 in the maintenance and operation cost per arc lamp per year. The cost per lamp for the fiscal year ending June 30, 1904, was $40.16, while the cost for the last fiscal year was $34.99, which is the lowest cost in the history of the municipal lighting plant.

CEMENT STONE

Block Machine Makers' Convention—Insurance Rates for Concrete Blocks—The Architect's Position—The Block Machine Makers' Position—Terms of Sale—Coloring—How to Make Sills, Steps and Molds—Concrete Blocks and Fire Insurance.

Convention of Makers of Concrete Block Machines.

The convention of makers of machines for making concrete blocks was called to order at 11 o'clock on Thursday, June 27, at the Great Northern Hotel, in Chicago, by S. L. Wiltse, of Jackson, Mich. Mr. Wiltse was made chairman of the convention and O. U. Miracle was made secretary. The following makers of block machinery and molds were present, in addition to a number of dealers in other concrete machinery and materials and representatives of engineering and trade journals:

Sid L. Wiltse, Jackson, Mich.

THE ASSOCIATION OF CEMENT BLOCK MACHINE MANUFACTURERS AND GUESTS.

C. C. Huston, Columbus, Ohio.
Noyes F. Palmer, Brooklyn, N. Y.
J. F. Angell, Columbus, Ohio.
C. W. Stevens, Harvey, Ill.
O. U. Miracle, Minenapolis, Minn.
A. L. Goetzmann, Chicago, Ill.
S. B. Young, Jackson, Mich.
P. B. Miles, Jackson, Mich.
Frank L. Dykema, Grand Rapids, Mich.
James W. Stone, Rochester, N. Y.
Mentor Wetzstein, South Bend, Ind.
J. P. Sherer, Milwaukee, Wis.
John Miller, Minneapolis, Minn.
E. C. Harter, Detroit, Mich.
R. J. Schwab, Milwaukee, Wis.
W. J. Scoutt, Chicago, Ill.
J. A. Ferguson, Denver, Colo.
N. J. Morehouse, Cedar Rapids, Ia.
F. J. Stutesman, Chicago, Ill.
J. W. Sanderson, Burlington, Ia.
C. C. Green, Columbus, Ohio.
Martin J. Healy, Jackson, Mich.
Ralph Spencer, Cleveland, Ohio.
Coltrin Mfg. Co., Jackson, Mich.

Organization committees were appointed and reported in the afternoon a name, "The Concrete Block Machinery Manufacturers' Association of the United States"; a purpose, "To further the interest of the industry of production of concrete building blocks and the advancement of their use"; qualifications for membership, "One person from each concrete block machinery manufacturing concern, accredited by being financially interested in said concern and presenting a certificate of membership"; and the usual officers. It was also provided that all meetings should be executive sessions unless otherwise officially ordered.

Papers were read by O. U. Miracle, Minneapolis, Minn.; Frank L. Dykema, Grand Rapids, Mich., and J. F. Angell, Columbus, Ohio, abstracts of which accompany this report. There were talks also by Noyes F. Palmer, of Brooklyn, N. Y., on "Patents and Hollow Building Blocks"; by L. P. Normandin, of Jackson, Mich., on the water-proof qualities of cement, and a general discussion of the subject of the manufacture of concrete blocks.

The afternoon and evening were spent in a trip on the lake, as the guest of Mr. Porter, of the *National Builder*, and the accompanying photograph was taken at the Chicago Yacht Club.

On the second day papers were read by S. L. Wiltse, of Jackson, Mich.; E. T. Cairns, of Chicago, and J. P. Sherer, of Milwaukee, abstracts of which accompany.

After a lively discussion the following resolution was adopted:

Resolved, That a committee of five be appointed by the chair to draft standard specifications for the manufacture of concrete building blocks, and that this committee be instructed, as far as possible, to co-operate with the insurance people in drafting such specifications as are made and approved; and that from 3,000 to 5,000 copies of these specifications be printed by this association for circulation among the trade.

O. U. Miracle was appointed chairman of this committee, with J. P. Sherer, F. L. Dykema, S. L. Wiltse and P. B. Miles as the other members.

J. W. Sanderson, C. C. Huston and J. F. Angell were appointed as a committee on freight classification and rates.

A constitution and by-laws were adopted, conforming to the report of the organization committee, and in the closing executive session the following officers were elected:

President—J. F. Angell, Columbus, Ohio.

Vice-President—O. U. Miracle, Minneopolis, Minn.

Secretary—Sid L. Wiltse, Jackson, Mich.

Treasurer—C. C. Huston, Columbus, Ohio.

Concrete Block Insurance and Resistance to Fire.

By Sid L. Wiltse, Jackson, Mich.

The subject of concrete block insurance is one of the most important that we have to handle. Since about two months ago we have been working directly with Mr. E. T. Cairns, who was then appointed chaiman of the Committee on Cement Construction by the National Fire Protective Association, which co-operates with the underwriters.

I sent letters to perhaps forty or fifty block manufacturers around the country, using all kinds of machines, and the letters that I received in reply were to the effect that rates on concrete blocks were in some places 25 or 30 per cent. higher than on brick, and at some places they were 30, and in the majority of places were just the same as brick, and they all reported they had not had any fires to speak of, only in one or two cases, and we have nothing showing where the concrete blocks withstood a severe test of fire and withstood the water that was placed upon them.

The Pettyjohn people at Terre Haute have taken hold of the fire insurance proposition. They have sent out a circular showing that a block building at Carbon, Ind., withstood a severe fire, while buildings all around burned down. Then there is the fire at Carmel, Ind., where the blocks are said to have been red hot and stood the test. There was a fire at Coleman, Mich., the same way. There were a brick building and two or three frame buildings burned and a concrete block building, which withstood the fire about the same way as this one. If we can get together here to-day and get outlines and specification for these engineers and insurance people to take hold of, I have no doubt we will get some re-

PRES. J. F. ANGELL,
Columbus, Ohio.

SEC'Y SID L. WILTSE,
Jackson, Mich.

VICE-PRES. O. U. MIRACLE,
Minneapolis, Minn.

TREAS. C. C. HUSTON,
Columbus, Ohio.

sults soon. A few months ago I wrote to a number of concrete block makers. But summing it all up, in the East concrete block seems to be about even with the brick, and in the West it is 25, 30 and 40 per cent. higher in some places. Taking it all together we are not quite down and out on the proposition. At the same time, it is not what it should be, and we trust that we will be able to get some action started at this convention.

During the discussion of Mr. Wiltse's remarks the following information was presented by various persons:

Mr. Dykema reported the use of limestone and sand in blocks, and within a few days after the walls were complete a very severe fire in the Japan room adjacent to this wall. A large quantity of water was thrown on it, and there was no damage at all.

Mr. Sherer, of Milwaukee, reported a very severe fire in a building a very large portion of the material of which was made of limestone and the interstices filled with sand. Mr. Gregory, the owner of the building, came out with the strongest endorsement for the material for fireproofing purposes. The fire occurred on the fourth story of the building, in a store room, in which was stored a lot of German Christmas toys packed in excelsior. The heat was so intense that an exposed soil pipe in one corner of the room where the goods were situated was melted. The fixtures and iron everywhere exposed were all burned, twisted and melted, and, having made an examination himself after the fire was over, he could not see that there was the least injury to the walls.

Mr. Hotchkiss of Chicago said that they made blocks entirely of limestone. They have several blast furnaces in operation in the city that are under a temperature of 3,700 degrees all the time, and the blocks have shown absolutely no effect from fire. They have also made tests by taking blocks and heating them red hot and throwing them into cold water, and that has no effect on them. In connection with furnaces it is not so much a matter of fireproofing. They are running a furnace that has been in use for eight weeks, and the problem was one of expansion and contraction, and where they get the benefit in using larger blocks is in the fact that there are fewer joints There is hardly a blast furnace running in Chicago using brick but must shut down for a few weeks in every year to replace, or lay out enough furnaces so that they can have one out of commission in order to repair it. Concrete is not good to put in to-day and start a fire in tomorrow. But it must be seasoned and can then be put up in a furnace, and if it is put up properly it will be all right.

A letter from Devils Lake, N. D., was also read, stating that concrete blocks were used in lining a cupola within a foundry. After about forty heats have been taken off the blocks show no action of fire, and stand the intense heat as well if not better than the St. Louis brick.

The Architect and Cement Stone.

By FRANK L. DYKEMA, Grand Rapids, Michigan.

In assigning to me the subject of architecture of hollow block buildings a rather difficult task has been given, considering the radical differences in opinion in reference to methods of manufacturing blocks existing between my firm and many of those present. In dealing with it I have tried to eliminate as far as possible any personal ideas I may have and to present the matter as nearly as possible from the standpoint of the architect. While to a large extent we are not dependent upon the architect for the success or failure in the sale of cement stone, and by this I mean that the recognition of the user of stone will eventually force recognition by the architect, still it is the architect finally who creates the style and develops the best method of using a new material, and finally we must produce that which the architect demands.

While it is true that three-fourths of the buildings constructed are never heard of by the architects, it is also true that practically all buildings are constructed along lines developed by architects at some time. The ideas are originated by the architect, and whether a plan is bought and paid for, or whether the ideas are borrowed from work already done, does not change the origin of the idea.

Broadly speaking, the art of architecture is the art of combining the qualities of utility and beauty. A building properly designed must satisfy as to proper interior arrangement, sanitation and convenience, combined with a satisfactory exterior effect, and in all a durable building as free as possible from repair expense.

There is no question as to the use of cement stone in building construction. Even the most obtuse of the architects admit this, however grudgingly they may do it. The general desire to-day in any construction is to create something permanent. American life has been a hurried one, and the most desirable quality in any construction has been immediate utility rather than long life. The standard of values is changing and permanence is demanded as one of the first requisites.

This is not alone apparent in building but in nearly everything in which wood has been used, and in many cases in such structures as have been made of natural stone, brick and steel.

With such a sentiment, that is, the demand for a material possessing the element of permanence, the development of the manufacture of cement has been opportune. Regardless of the cost of brick, wood or natural stone, a field must develop for cement stone.

The first demand by the architect is quality. That we can supply. Little question is raised now as to the qualities of cement in building construction in durability. Freedom from the effects of the elements, which tend to destroy other materials, is too well known. The value of the hollow wall as a sanitary feature is a fact that has been recognized for many years and striven for with poor success and greater expense in other types of construction. The fireproof quality is generally acknowledged by everyone except the fire insurance people, upon whom our good friend, Mr. Wiltse, has been making a good fight.

We have, therefore, to offer to the architect the ideal material so far as quality is concerned, but he asks more than this. To develop artistic effect he must have more to work with than mere durability. This is the work that is given us to do. We are the pioneers in a great movement, and we must create the ideas for the architect to work with.

Cement stone represents a radical development in building construction. It is now absolutely so; it is an honest material; it gives full service wherever used properly, and its use makes possible novel effects in the exterior of buildings. To develop artistic effects the architect requires adaptability as to form, opportunity to use contrast in color, form, line or texture. The whole necessity finally develops into the ability to develop contrast.

As stated above, cement is an honest material. It is a good material and is amply able to stand for itself. Artificial stone, which we all started to make, is already a thing of the past. Cement stone is the material we are dealing with now, and as cement stone this new material must stand or fall. The architect does not recognize an imitation or anything artificial and will not deal with it as such. But there is no necessity of imitation. Cement is rich in possibilities, both as to form and finish. The production of any form demanded by the architect is only a matter of mechanical genius, and the development of proper finishes and effects is a matter of study and thought to bring out the latent qualities in the material with which we are working.

The Position of the Block Machine Manufacturer Relative to the Public.

By O. U. MIRACLE, Mineapolis, Minn.

The business of manufacturing concrete building blocks is but a small portion of the concrete industry. While this business as a commercial proposition is a matter of very recent development, it is, to say the least, a remarkable condition and a fact worthy of comment that five years ago the cement building block was comparatively unknown. There was but one make of machine in the field for the manufacture of concrete building block—that of H. S. Palmer—while today there are upwards of 4,000 plants in operation in different sections of the United States; some towns have only one, while others are favored with as many as twenty. There are at the present time about one hundred different makes of machines being manufactured and offered for sale. The concrete block is here to stay. It is known in every nook and corner of this country, and its use is very rapidly increasing. It fits into any place wherever brick and stone were ever used; and besides being better and more durable, is in most cases cheaper.

While the large majority of the plants that have been started for the manufacture of concrete blocks are highly successful, there have also been some failures. Because it was a new proposition, because it held out alluring profits, because small capital was required to start, men have been attracted to this business from all lines and professions. The great majority have been successful and to-day find their balances on the right side of the ledger. But, as I have said before, there have been some failures, and right here we might as well stop and ask the reasons for them. There are many reasons, some legitimate, and some not. So long as men are mortal there are bound to be some failures. Some have gone into the block business who would make a "fizzle" of any line. There is no remedy for them. But, on the other hand, others who are in reality good business men and who have been successful before in other lines, have either failed in the block business or have not met the measure of success they should have, for other reasons, the main one being lack of knowledge and information, which should have been given them by the man who sold them their machine, who started them in the business. This is the one great diffi-

culty we meet, and I shall propose a remedy later on.

While we must certainly not pose as public benefactors, at the same time I believe it is necessary for us to face the condition as it is and admit that we, as manufacturers of cement block machines, are to a certain extent responsible to the public for the class of material that is turned out. The block manufacturer in nine cases out of ten is not familiar with the business. Having no reliable literature upon the subject, he naturally gets his first instructions and first information about the business from the man who sells him his machine. Many of these salesmen have been inclined to paint the proposition up altogether too rosy, in fact some have actually misrepresented it; they have overestimated the amount of profits that can be made in the business.

As a sample of some of the stories that these salesmen tell, a customer recently came into my office who was in the market for some concrete building blocks, expecting to use them for a residence. He had been told by the agent for some block machine that he could buy a machine, start making the blocks on Monday with two men, and have another man commence laying the same blocks on the following Tuesday, and have them all laid in the wall inside of twenty-four hours after they were made. But this preposterous proposition hardly compares with the statement I heard a "would-be" salesman for a block machine make over in Canada the other day, when he said that cement blocks could be made of a mixture of one part of cement to ten, fifteen, or even twenty parts of sand. In fact, he said it wasn't material, just so there was some cement used. And I want to impress upon you that you owe it not only to your customer, but to the public, to provide the manufacturers with reliable and dependable information upon the actual manufacture of the goods.

I have stated that this cement block business is a very attractive field for the investor. I want to tell you some of my reasons. In the first place it promises to out-strip all other building materials in general use. Its beauty, cheapness and durability appeal to the intelligent builder. A comparatively small investment is required for this business as compared to a business of manufacturing any other line of building material, such as brick, terra cotta, lumber, etc.; the profits on this investment and the fact that the field is unlimited entirely remove any hazard to the investor in a plant for the manufacture of building blocks. The keynote of the whole situation, however, is, in this as well as in all other business ventures, confidence. This material must be firmly established. It must have the confidence of the architect, the confidence of the contractor, the confidence of the builder, the confidence of the owner, the confidence of the legislator, the confidence of the insurance company and the confidence of the public in general; and it is up to us to help create this confidence and maintain it. It has been said that "A chain is no stronger than its weakest link." The links of evidence in this case are in our hands. Let us see to it that every one is carefully welded; that there are, in fact, no weak ones. We have many rivals, whose fields we have usurped; whose outlet for material the cement block has cut off, and who are jealous of our success. They are constantly on the alert for a chance to pick one little flaw, and once found they never stop talking about it. A small defect like one cracked block, or a small check in a wall grows as it passes from mouth to mouth, until the building becomes a complete wreck in the hands of those who hear the story, and the material is condemand by those who have not sen it.

The lines of building material opposing concrete are organized, and we must meet organization with organization. By way of illustration: In 1901 the freight handlers of this city went on a strike, dropped their work entirely, and, with the efforts of a sympathetic strike of the teamsters, who were also on a strike, won every point they asked for against their employers—simply because they were organized, and their employers were not. Last April the teamsters of this city were called on a strike in sympathy with some minor garment workers' union, and today they have practically lost out. This time there is organization on both sides. The employers are organized as well as the unions, but the strongest organization is on the side of the employers. Hence the results.

While ours is by no means a parallel case, this illustrates plainly that it is time for organization, for unity of effort and concerted action, and this is the remedy I propose: We should here perfect a thorough organization of the cement block machine manufacturers of the United States; invite every manufacturer, whether large or small, to join; make the initiatory fee large enough to create a fund to do business with, and pay this fee before leaving this hall; appoint a committee at once who will get immediate action on the matter of drawing up standard specifications for cement block making, such as will be approved by the best engineers of this country and the insurance people; put a copy in the hands of every man now manufacturing cement

building blocks; supply each manufacturer of block machines with sufficient copies so that he in turn may supply his salesmen and customers and go on record before the world for a material, the quality of which must be unquestioned. If you have a salesman in the field who is inclined to misrepresent this material or the manner in which it should be made, tie him down to these standard specifications, and if he varies from them one iota fire him at once. The block maker in most cases gets his first ideas of the concrete business from the salesman, and if there is any poor material made in the future it can be traced right to the door of the poor salesman. The salesman must be right. He must be honest with the customer and honest with the public. Let our watchword be confidence. Let us merit this confidence—an honest product honestly made and sold at a good profit.

Terms of Sale of Block Machinery.

By J. F. ANGELL, Columbus, Ohio.

We realize where there are so many kinds and classes of machines being placed on the market, and so many manufacturers and agents so anxious to introduce their product, it would be a difficult matter to suggest or present a basis on which machines should be sold, and that, as a rule, most people feel that they know the conditions and circumstances under which they are operating, and think no outsider has any license to suggest a basis on which they should do business. In other words, they feel they know their business. However, we will endeavor to give our views on the subject as best we can.

In the first place, we all know as a business proposition that machines should be sold on a cash basis. Cash at the usual discount should be obtained when possible. If not, one-half or two-thirds of the price of machine should be cash and balance in secured bankable paper, and the license and agreement entered into by the selling and purchasing party should be worded in such a manner that the machine remains the property of the selling party until fully paid. We feel that the sale of block machines has reached the point where no manufacturer is obliged to or can afford to sell on any other terms.

In our opinion, agents should be paid a commission that will justify their looking up a substantial party in every place they visit before attempting to make a sale, instead of trying to drive a bargain with the first fellow that tells them cement block is a good thing, and that he wants to get into the business, and at the same time he may not have a dollar to invest, and can only embark in the business by the manufacturer furnishing him an outfit and taking his note for same, which in the majority of cases can not be discounted. Consequently the manufacturer is obliged to carry the account until the purchaser has sold enough of his product to enable him to pay for the necessary material to produce the blocks, after which he is ready to pay what little he has left on his account for the machine.

We hear of cases where machines are shipped to different parties on from 30 to 60 days' trial. This is entirely wrong, and should not be. We all know a great many people get quite enthusiastic over the cement block business, but after they have had a machine for a while and find an additional expense in the way of pallets, material, etc., and do not see any quick returns "which, perhaps, they have been led to believe would be forthcoming by some over anxious agent," they get discouraged, claim the machine is not as represented, and cancel the order if possible; and if the machine is taken from them it leads others to believe there is something wrong, virtually killing the business at that point, and, as a rule, it takes some time for the same or another representative to interest a substantial party.

Cement machinery, like all other new devices placed on the market, is, as a rule, taken up by a class of people looking for something new, simply because they have never been able to make a success of the new or old enterprises in which they have taken part, consequently having little money to put into the business. This is the class of people we should make an effort to keep out instead of getting them into the business. No question but what the cement machine, as well as block manufacturers, have had a great many obstacles, such as the inexperience of manufacturer and user, opposition of producers of other building material, rates of insurance, competition between themselves, etc., to overcome, and have been obliged to do things they know were not on a business basis, but I feel that the business has progressed to such an extent and that the general public has become enlightened upon the durability and practicability of cement to such an extent that cement block machine manufacturers can safely turn over a new leaf and demand that their agents make no sales except on a cash basis.

Coloring of Concrete Blocks.

By J. P. SHERER, Milwaukee, Wis.

I have read some papers on this matter, but in addition I have been making some experiments that perhaps might interest you.

We experimented with many kinds of coloring made in this country and in Europe. We found none of tehse desirable. Some were detrimental, inasmuch as they contained acidulous or greasy matter, which was a detriment to the cement. The most desirable we found to be the iron pigments or oxides of iron of different kinds, yellow, buff and gray more particularly. In my experience as a block manufacturer, I find that red color is more desired by our customers than any other. Consequently we have made more use of that color. We mix the color with the cement first, arriving by experiment ing at exactly how much color by weight we would require for a certain number of cubic inches of cement. This is done by making briquettes and allowing them to dry. Many of the oxides are not very strong in coloring matter, and I will add here that your customers many times think they desire a stronger color than they really would have. In my later experiments I find the more delicately colored stone to be more desirable, speaking from the standard of commercial product.

Of course, you all understand that adding color to blocks will increase the price, and many people do not care to pay the advanced price that they may have to in order to get this colored product. The action of the free lime in the cement kills the color to a certain extent, and until your product is thoroughly dried out you never know exactly how much color is necessary. When you have found out what this amount is, it is essential that it be thoroughly mixed in so that your product may be uniform in color and not streaked or spotted. My practice has been to mix this color or pigment with the cement, mixing it thoroughly. In addition to this, I use the dryest possible aggregates that I can find. If I am using sand it must be thoroughly dried, kiln dried, if possible. The dryer it is, if mixed carefully, the better the results. I find it very necessary to be careful in applying the moisture to this already mixed sand, color and cement. It is a habit of many of our concerns, for we want to make a certain number of feet per day, to administer the water in too large quantities. I have found it desirable to spray it on in as light a form as possible, so that the action of the water when coming in contact with your aggregates does not wash the color from the cement and sand.

In using color, I find it necessary that we use more care in mixing than we would in making our ordinary stock. When in Indianapolis I stated that I had been requested by an architect to make a green stone. We find that green color in almost all cases contains acidulous matter, and while I have made some specimens and have been adding to them from time to time, making the body of the stone an olive green, adding a livelier green color through it as streaks to imitate a certain stone, I find that this stone at present shows no sign of disintegration or giving away of any kind. But I have learned one thing in my experience in concrete, that it sometimes requires a long time test to find out exactly what your aggregates and your combination will do when exposed to atmospheric influence for a period of several years, and consequently I do not form these conclusions hastily. I have recently been making experiments with more delicate tints of these coloring matters, and I would suggest that if you have any call for colored product, instead of allowing your customers to suggest what they want, that you make them some samples of various colors, using but little coloring matter, getting delicate shades of different colored stones, in which there is no possibility of the pigments or water compound you use being of much detriment to the cement, and you will invariably find your customers selecting one of the delicate colors in preference to the ultra colors. We have not been asked to make colored stone nearly as much in recent years as we did when we first started in the business. It seems to be the general idea that they would prefer the natural color product, cement stone themselves. They have a certain individuality, so that it is not necessary to imitate anything—they are a stone in themselves.

The amount of coloring we use is governed largely by the coloring matter that the compound contains in itself. So I can not give you any formula, because the character of your aggregates and the strength of the coloring matter would depend entirely on themselves. I might say to you that I mix a certain amount of coloring matter with my aggregates to get a certain result, when in another locality you would have something to overcome in your aggregates which is not in mine. So I say the only way you can arrive at any definite conclusion of what you want is by experiment. It is easily done, only making small briquettes, allowing them to dry out, as the mason would do with his mortar to make colored joints in his work. He makes a small quantity, allowing it to dry out. Many people think this product fades. That has not been my experience. It grows lighter up to the time it is thoroughly dried out,

then, if anything, it grows darker with age. I have one house in which I used these colored products, perhaps eight or nine years ago, and it grew light until such time as that it had become thoroughly set and dried out, and it has grown darker ever since with smoke and the other elements in their effect on the material.

We use mixing machines. We mix our cement and color together before we place it in the mixer. Then we place it in the mixer at times when we are in a hurry. Otherwise we mix it all by hand and spray this mixture as lightly as possible. In a mixer you have left, perhaps, a taint of coloring and it will follow in something else you may mix after, so that it is advisable to use a separate mixer for color work. Those things are being taken care of, I beileve, in more recent styles of mixers, in which the aggregates are mixed dry.

I have some friends who are engaged in the sand-lime brick business, and I was anxious to see what effect their induration and high pressure would have on a cement block. Incidentally, we made some blocks of the mixture of 8 per cent. hydrated lime, in addition to 10 per cent. of cement used in our block, placing it in the indurating tunnel for eight or ten hours. The result is that I have in my office some very mild light-colored stone. The stone has had no water since it was made, four or five weeks ago, and it is very hard and seems to be hardening up yet a good deal, after the manner of sand-lime brick. The lime was 98 per cent. pure, with about 2 per cent. magnesia and salts. Cement block makers do not understand the difference in lime. For instance, there is lime that contains anywhere from 20 to 40 per cent. of magnesia. It ought not to be associated with cement in any way. I do know that these limes that are highly magnesian are detrimental to the cement product.

How to Manufacture Window Sills, Door Sills, Door Steps, Mold Construction, Etc.*

By Paul Wilkes, Cleveland, O.

Many have attempted to manufacture window sills and doorsteps. In the following I will introduce a system of construction. The creation of the form is in itself simple, yet it required years of experiments to ascertain the best possible method and best form. A description of forms and the manufacture of sills and doorsteps as I have seen is as follows: Nail a box together and tamp it full, then smooth the stones with a trowel. Such stones do not deserve the name of stones; they are simply troweled concrete lumps. A good art stone does not want to be troweled. Only the seams need to be gone over, and so that later you cannot notice the marks of the trowel. All visible sides of the form must be free from errors and unevenness, so the shadows, when the light strikes them at an angle, will not show any deficiency. Such stones for fireproof schools, hospitals, city halls, business blocks, etc., will find ample use, and have already done so.

The present hollow block industry needs not only hollow blocks faced, but blocks as near like nature's stones as possible, made as described in "How to Manufacture Concrete Hollow Blocks."

The following described system and stone can be put up much cheaper than natural stone and wood.

It is best to use yellow pine forms or molds well seasoned and without flaws. To make a wood form water-proof the following has proven successful: Smooth the sides with sandpaper, then paint them with a solution of alcohol and shellac; then polish lightly with fine sandpaper after the paint is dry. Follow with a second coat and that with a third. On the last coat use a woolen rag while it is about half dry and rub down until polished. This process makes the wood absolutely moisture and water-proof, and almost any quantity of stone can be made from such a form.

A practical, quickly removable form, and also easy to handle and of easy constructions is absolutely necessary to produce stones in large quantity. Of the many devices a strong iron clamp as shown in Plate I has proved the most practical and serviceable. The entire form is thus held together and no part can be tamped out of place.

A clamp with screws has not proven successful where much work is to be done—the pressure surface is too small, the forms soon show holes on the outside, they require more labor and time and frequently the screws come loose. The best are the wedges on clamps as shown in Plate I, a system by which steps can be made of any width. You can with this form also make any breadth or height by simply changing the side pieces. This will make smooth and profile stones. Whether you make the stones simply smooth or with a profile makes no difference in the construction. Stones with profile save material through the insertion.

After the mold is tamped full, the stone is immediately removed from the form. This can be done in two ways, either by having a wood pallet and sand foundation or only a 6-inch sand surface.

* Reprinted from the Artificial Stone and Concrete Builder, Cleveland, O., with permission.—Copyrighted by Paul Wilkes.

Stones up to 8 or 10 inches can be turned without the use of the pallets. Smooth the sand foundation with a smooth board or lath, then turn the form over on one side, then turn over quickly; it requires a little practice to do this successfully, so that the stones do not fall out while turning, which sometimes happens when the under surface is larger than the top. Stones under 10 inches are easily turned.

If steps are made wider than 10 or 12 inches, we are compelled to make a sand foundation about 1-2 to 3-4 in. thick and smooth this over and fasten the pallet with screw-bolts as shown in Fig. 4 or with wedges as shown in Fig. 6, Plate I. referred to. In making changes in the form by adding a lath for the rounding, be sure to plane it off out of the board smoothly, otherwise a crevice will show.

After the form has been cleaned it is immediately used again for the next stone. In making large quantities, it is advisable to fasten sheet iron strips around the top of the form so as to prevent damage to the top by the tamper. Such a form will finish thousands of stone if properly taken care of.

The manufacture of window sills is done in exactly the same manner. For tool-facing use corrugated zinc or sheet iron and nail down over the bottom with

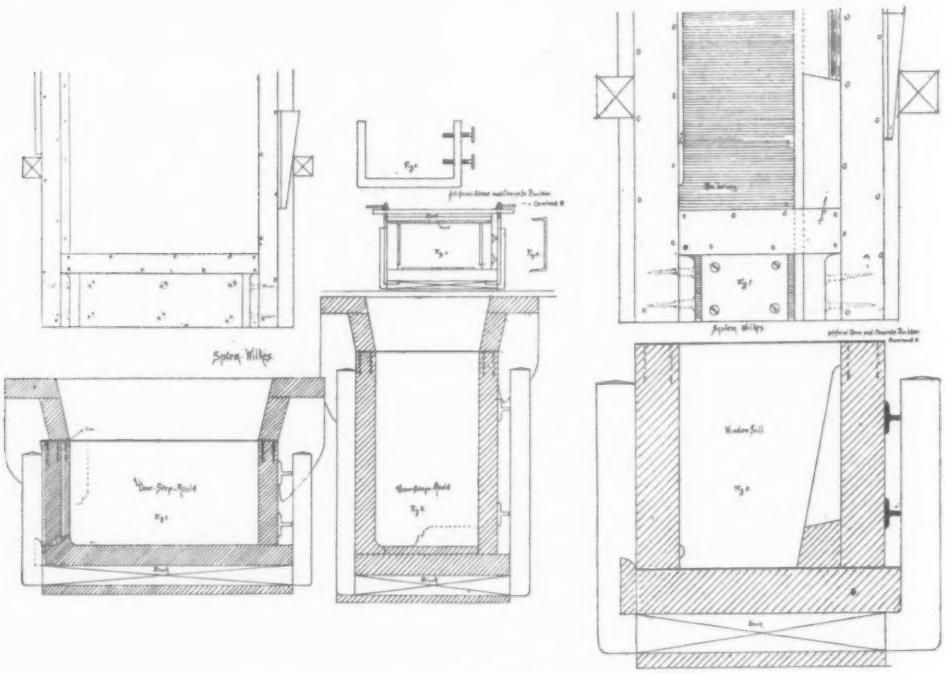


PLATE I. FORMS FOR MAKING CEMENT STONE.

After the pallet is securely fastened the stone is turned over on a 4 to 6 inch sand foundation. Stuff sand under the ends with a board so it will not sink; then remove the wedges and take off the form, clean it off with a broom or brush or rag and put together again for the next stone.

For stepping stones Fig. 2 or 3 can be used, according to the width of the step. If you have steps wider than 10 or 12 inches use Fig. 2. The construction Fig. 3 is for ordinary steps. In all stones the facing is done at once and the entire stone tamped full at once with a tamper covered with tin, or of wood, or iron, which is fully described in the pamphlet above small nails. In this way we obtain the best imitation of hand worked natural stone. The clamps are also used here on the bottom fastened as stated already. This form of construction enables one to make door steps and sills in all required lengths from the same forms. Make one end fast permanently, while the other can be enlarged or diminished according to requirement. If desired to make different thicknesses, change the end boards for different heights, the side boards also. All ordinary window sills can be made without the use of the pallet by simply turning over into a sand-bed as described. The material is mixed to the moisture of earth, then the facing is put on with a

trowel or as described in "How to Manufacture Hollow-Blocks."

For the construction of forms, drawings in full size where all parts are measured are almost a necessity even for practical carpenters. For this reason we have full sized blue prints for the forms.

All door steps for frame houses can be erected in concrete stone at the same or less cost than wood by placing a small concrete foundation under them about 6 or 8 inches deep at the ends.

It is advisable not to sell the stone before they have been dried out 4 to 6 weeks, so that they may not be damaged in transportation. It is advisable to make the customary stock sizes, 3 ft. 6 in., 3 ft., 2 ft. 8 in., 2 ft. 6 in., 2 ft., and keep them on hand in stock.

In conclusion, the remark that the mold construction is not patented and for this reason will soon find plenty of use and competition. As regards the latter, permit me to say that healthy competition is the life of trade, therefore the more engaged in the business the better it will be for the industry and its advancement, and the limited use at present will be increased over yet unknown territory.

For this reason no one should, as is frequently done, belittle the product of any one else, which act simply retards the entire business, the public coming to the conclusion that the art-stone are all of no use, and resorting to something else.

The use of art stone in building is a new addition to the great extended field of building construction. With the increase of this industry through the latest improvements, especially the latest building designs, the stone must meet every requirement. The concrete stone structure varies somewhat from the natural.

Fig. 1, Plate II, shows a wooden roof with gutter and plate. The plate is best made as thick as the wall, gaining thereby a better distribution of weight and better construction. For better security these can be united with iron clamps imbedded and held together with screws. The cornices are made of zinc or tin, so constructed that they are free to expand.

Stone building cornices of better grade should never be made entirely of wood or tin. Tin is only used for the gutters. In Fig. 2 is presented such a cornice structure.

In such construction it is above all things else necessary to observe that the tin tablets are free and can not bind each other and tear. Fig. 2 shows the under tin in an eave trough fastened with lead

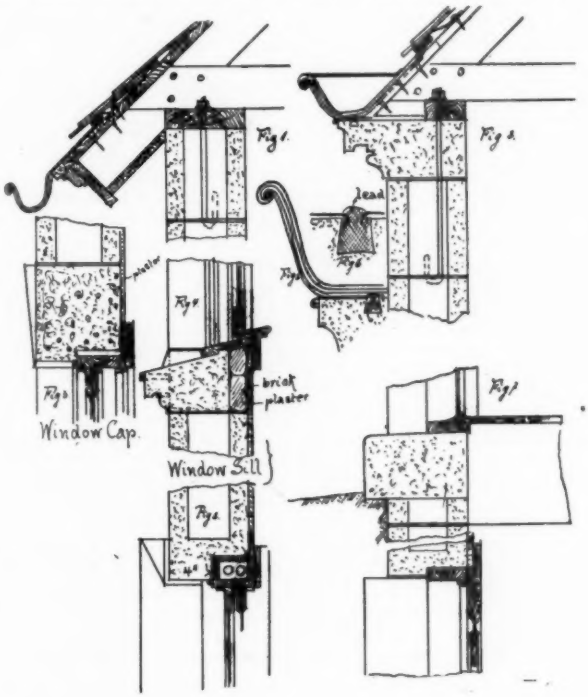


PLATE II. ROOF AND WINDOW CASING SETTINGS FOR CONCRETE BLOCK HOUSES.

as shown in detail in Figs. 5 and 6. The inner support and the strength of the eaves is obtained by resting it on the iron insertions which are inserted at distances of 1 ft. 6 in. to 2 ft. 6 in., according to size. The seam between the tin and the stone profile is protected by a tin rod, soldered on to the lower tin plate. Tin should not be nailed. In such construction, where two metals are used in eave troughs, the iron should be zinced or at least covered with asphalt. Such construction, unless insulated, suffers much from electric currents, more so than much atmospheric changes and oxydation.

A section through window caps is shown in Fig. 3. The height is governed by the weight and window opening. In larger widths than 3 ft. it is best to reinforce with iron braces, round or flat or galvanized wire. Always insert the iron rods in the lower part so as to take up the tensile stress. The pressure is taken up by the concrete. In large spans it is best to calculate.

Window sills should always have a projection at least 1-4 in. high on the wash. This projection prevents the inner wall from becoming moist. Without this projection the water is carried into the mason work. The wooden sill frame can be laid in a planed notch or groove or simply set on the stone. This forms a drop edge or drainer. See Fig. 4. Care is to be taken in building that the mechanics do not knock this edge off with a hammer, as their work is somewhat easier without it. The window jam should always be made with a projection, which can be made by a wooden block inserted in the machine. This is necessary for sliding windows. A section of an upper door step is shown in Fig. 7. Mortar can only be used on the ends of the stone. An oak door sill is best to use next the stone.

Concrete Blocks and Fire Insurance.

By E. T. Cairns, Chicago, Ill.

I like the way your committee of arrangement has designated the title of this subject on which I am asked to speak—"What the Underwriters and National Fire Protection Association are Doing for Us from an Insurance Point of View on Concrete Blocks."

I believe we can do a great deal for each other in this work, and I assure you it is a source of gratification to the Underwriters and N. F. P. A. to have brought to their attention so plainly your desire for co-operation, to the end that good construction of this sort may be assured. If, by laboratory experiment and compilation of actual field experience, we can indicate to you lines along which your blocks can be improved in fire resistive quality, we shall really have done something for you, and I am sure you can do so much for the insurance interests if, by the use of the large fund of knowledge your experience has given you, supplemented by such suggestions as we may be able to offer, you can compel the users of your machines to produce blocks of certain known good qualities.

Insurance companies are seriously interested in the subject, and if I can correctly judge the intentions of you gentlemen, they must continue to be seriously interested. They are vitally concerned in all forms of construction, processes of manufacture, and methods of fire protection, and in order to successfully conduct a fire insurance business, the management of a company must, either personally, or through subordinate engineers, know how buildings of various types and of all sorts and conditions of occupancy will behave in case or fire, and how susceptible they each are to various kinds of fire protection, external and internal, public or private. A knowledge of these points is not a simple matter, and so vitally concerns the success of the institution that care must be exercised in the study of each subject. A hasty opinion on the fire hazard of a given process of manufacture, or the fire resistance of a certain style of construction, or the value of a new scheme of fire extinguishment, may result in large losses which could have been avoided by a more careful study of the problem.

In order to facilitate the study of these subjects of fire prevention and fire protection, the N. F. P. A. was organized some years ago, and is doing a good work in reporting to insurance companies and the public the results of their many and diversified investigations in laboratory and field. The association is not strictly an insurance organization, as it has a large subscribing membership among men in other lines of business who are interested either for personal or business reasons, in seeing the science of fire protection engineering advanced and the more than two hundred million dollars of annual fire loss in this country reduced.

A little less than a year ago this association appointed a special committee to investigate the subject of cement as used in various types of building construction, in recognition of the rapid increase during recent years of the use of that material. The committee has made considerable preliminary study of the subject and some tests of cement and concrete, in the shape of beams, and expects to make, within a few weeks, more tests on blocks. I fancy we have had to approach the subject somewhat in the same way you gen-

*A paper before the convention of Manufacturers of Concrete Block Machines.

tlemen did when you first heard, not many years ago, of the idea of a cement building. Portland cement was not a new thing to you, nor was it to us. We both knew some of its characteristics, perhaps had used it in building operations, but just how to make a block of cement and sand or stone so it would look well and withstand the attacks of weather and time, and still be commercially practicable, was a problem not to be solved off hand and seems not to have been entirely settled yet. In fact, it is still so indefinite that two important magazines, specially interested in cement, have offered prizes for the best solution of the numerous difficulties. We have known fairly well the fire resistive qualities of cement, as used in numerous ways, but its use in the form of hollow blocks is a comparatively new proposition, and some study will be necessary before the blocks can be properly classified as to fire resistance and proper consideration given therefore in the insurance rate.

The statement is often made that concrete is "absolutely fire-proof." Now that is a rather rash statement to make about any building material. Many things which do not burn are far from fireproof. It took the public several years to learn that cast iron and steel, while, of course, non-flammable, are not fireproof and have to be very carefully protected against heat when used in building construction. Stone has long been known as utterly incapable of resisting fire of any importance. Bricks are commonly regarded as the nearest thing to fire-proof in building construction, and as they are now understood that is doubtless true; nevertheless, even bricks fail under extreme exposure and are frequently so damaged in appearance or strength as to be practically ruined. Down at the laboratory we actually melted bricks in a test furnace a few weeks ago. Hollow tile does not burn, but it has its faults as a fire-proof material, one of the most serious of which is that in severe fires one side of its shell sometimes heats up so much more rapidly than the others that the unequal expansion causes the block to break apart. Furthermore, in the form at present in use, it is difficult to bond it together rigidly enough to stand extreme fires.

Concrete is subject to some of the weaknesses of these other materials and has troubles peculiar to itself, but in discussing these limitations I do not mean to imply that concrete may not be quite as fairly entitled to the nominal term "fire-proof" as any of these others. I should very much like to be convinced that it has a little better claim, but it is not only fair, but positively necessary to the proper and successful use of the material that its faults, as well as its virtues, be as fully understood as possible.

The integrity of a concrete block depends absolutely on the cement used in it. If that cement, which is a crystalline substance in which water is an important part, dehydrates or gives up its water of crystallization at a low temperature, its ability to bind the sand or aggregate together is lost early and the block will collapse. Now at just what temperature different cements will thus fail and how rapidly that failure will progress inward in a block set in a wall is not yet known, so far as we have found out. Perhaps we shall find that this is not a serious matter, but it is a point which must be demonstrated. Hollow concrete blocks must, in some measure, share the weakness of hollow tile blocks as to liability to break from unequal expansion of its different sides. I doubt if any one knows yet just how serious a matter that may be, but the experience with fire at Geary, Okla., of about two weeks ago, which some of you will remember, seems to have demonstrated both the above points, if my information is correct.

Another question is the possibility of making a good substantial joint by means of ordinary cement mortar between two blocks of concrete, and whether these joints will hold well under fire.

Then a real and vital difficulty, after these other questions have been satisfactorily disposed of, is the problem of insuring good workmanship in the manufacture and erection of these blocks. This, it seems to me, is the point that calls for your most careful consideration. Can we in any way govern the use of the machines you sell over the land to all sorts of men, so that the blocks turned out will contain the proper quality and proportion of ingredients? Perhaps you will say that difficulty is only the same in this business as in every other. It seems to me, however, that it is different for the present, in that the purchasers of the product, and even architects in charge, up to this time have had so little experience with cement blocks that they can not tell by inspection what the quality is, as can the purchaser of more staple goods. Furthermore, he is not buying blocks often enough, so that if he finds by use that a certain block is deficient, he can change to some other make with only small loss. Doubtless the men engaged in the manufacture of cement blocks will average up pretty well with business men in general, and it is reasonable to look for about the same proportion of people who will stoop to dishon-

esty in measure or quality when competition seems, in their judgment, to require it. This is one of the difficulties which can not be solved in a laboratory, but which must either be settled by you who control the block machines or be left to the slow process of time to develop the discriminating judgment of the public. I trust it will not be left entirely to work out its own solution in time, but that this or some other organization will make a serious effort to formulate or enforce a standard of quality for concrete block which will take them out of their present uncertain classification and place them where insurers and the insured may have reasonable ground for confidence in them as fire resistive material.

Now what can actually be done about it—where can we begin? The N. F. P. A. and the fire insurance interests are anxious to do all in their power toward having a standard adopted and enforced which will compel good work from all makers of blocks and, as already stated, intend making laboratory tests for the purpose of ascertaining what kind and proportions of materials will produce the best results.

These tests should cover such range of materials as are in common use and also the various proportions of mixture of all these materials. Solid blocks and blocks with a single cell, or with two or more cells, should be compared, as should blocks made of one mixture throughout, with those having a facing of a special composition. Possibly there are differences of method in curing which should be the subject of special test. The various kinds of cement can probably be tested to better advantage in some other shape than in hollow blocks and the results be applied to concrete in any form. Of course, all the samples should be made under the same conditions and tested at the same age. I would suggest that, for the purpose of testing, the blocks should be built up in the form of a small wall, arranged to receive the heat of a gas furnace, all samples to be subjected to the same temperature for the same length of time. Just what temperature and time will have to be arbitrarily determined, to meet as nearly as possible the most severe conditions of actual practice with buildings of the kind in which the materials are used.

Such a series of tests, it seems to me, should be made on concrete blocks simply as a class or type of construction, and not for the purpose of exploiting the product of any special machine builder or block maker. I do not believe it is within the province of our committee to attempt to discriminate between different machines on a basis of fire resistance of the blocks they produce, nor to judge of the ability of various users of those machines. I would suggest, therefore, that if you gentlemen desire to co-operate with us in this work you consider appointing a committee to arrange to have made, at our laboratory, a set of samples of various kinds which, after proper curing, shall be subjected to fire tests. I would also suggest that such a committee could be of great help in collecting data relating to actual fires in buildings of concrete block construction. The result of such tests and other data should furnish basis for a standard for concrete blocks which would naturally result in the production of more nearly fire-proof materials—then when, as previously suggested, some means shall have been devised for compelling a general observance of this standard, our work will have been accomplished.

In closing, I beg to assure you of the independence of the position of insurance companies on the question of building materials in general and cement blocks in particular. They do not take sides in any controversy between rival interests save as they can logically demonstrate the superiority from their point of view of either side of the question. We have no commercial interest in any system of construction except the one, whatever it may be, that occasions the least loss by fire, and you will find prompt recognition of all the claims to superiority in your materials which you can demonstrate in "a logical, practical way."

Since writing these notes, I have had a call from Mr. R. L. Humphrey (President of the National Association of Cement Users) in regard to co-operation along the line of fire tests. I am not familiar with the plans, but I take it that numerous other interested people, government engineers and railway users of cement, have in mind rather an extensive examination of the subject of cement itself and cement products. It seems to me to be a very desirable thing that whatever is done in that line should be done with the co-operation of all the other interests. It would not be of any use for you gentlemen to make one standard for cement and concrete blocks, and then have the railroads make another, the United States government make another, and then the insurance people go along on their own basis. The very best that can be done in that line will be done in unison, and I think that, notwithstanding the difficulties you have in view from your standpoint, some means can be found for making such a general specification as will meet the requirements of all the interested people and will be susceptible to general practical application in the local field.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal Reports.

Report of the Public Buildings Commission of the City of Saint Louis. Rolla Wells, Mayor.

The Public Buildings Commission, of which John Lawrence Mauran is chairman, presents this report, describing the various municipal institutions and their needs in the way of buildings. It then presents drawings, showing an ideal poor farm for the city and two plans for a municipal court and public parkway, which will provide, at a minimum of extra expense, for a proper location and grouping of the municipal buildings which are imperatively demanded at this time and for the future location of those which will be required in the near future. The plans include the present city hall, a building for the city courts to be placed opposite, and other city buildings of the future, and one of them includes a parkway to the new public library. Some photographs, showing what such cities as Paris, Dresden and London, have done in the same directions, are added to the report.

Thirty-second Annual Report of the Water Works of Newport, Ky., 1904. J. O. Jenkins, Pres. of Commission; W. L. Glazier, Supt.

The works are keeping up their record of recent years, the total receipts of $57,512 being larger than ever before, and sufficient to pay the operating and betterment expenses, $24,292, and transfer $32,500 to the sinking fund. The city seems to pay the interest on the bonded debt, amounting in 1904 to $24,456. The indebtedness is decreasing about 5 per cent. each year and the interest still more on account of refunding at lower rates. The report is not made on the standard form.

Annual Report of the Water Commissioner, Somerville, Mass. Frank E. Merrill, Commissioner.

All of the population, estimated at 71,000 on 4.22 square miles of city area, is supplied with water, which is taken by the Metropolitan system from the Nashua river at Clinton. The city pays its share of sinking fund, maintenance and interest on the cost of the metropolitan system, amounting in 1904 to $86,736; for which it receives an average of 6,228,000 gallons a day. It costs the city $65,544 to distribute this water to its citizens, including extensions, maintenance and interest on its own bonds. The income, however, is large enough to pay all charges and also $30,500 for sewer maintenance, interest and bonds, and $34,000 to support the fire department, besides furnishing $12,000 worth of water free to the city departments. Meters are gradually increasing in number and the meter rate is 12 cents a hundred cubic feet, or 16 cents a thousand gallons, which is said to be the lowest rate in use in the metropolitan water district. Should the city pay its proper share for fire protection, the rates could be materially reduced with equity to water consumers. Perhaps the charging of sewer expense to the water consumers is an equitable system, since all inhabitants are served with water and presumably are furnished in some way with facilities for draining their waste water away.

The standard form of annual report is used.

Report of the Chief Engineer of the Board of Estimate and Apportionment of the City of New York, 1904. N. P. Lewis, Chief Engineer.

During the year 390 street and sewer improvements in the various boroughs were authorized by the board, the total estimated cost of which was $4,156,490. Additional reports, 119 in number, were made but not acted upon, 112 projects have not been reported upon and 260 were defective and not brought to proper form, making 881 under consideration. This gives some idea of the work of the office, which must pass upon all improvement resolutions in the entire city.

The New York Central railroad asked for approval of changes in its plans for a railroad station which transform it into a monumental building for the use of the railroad only and greatly improves its appearance, especially since it is proposed to set it inside the present building lines, 40 feet on the south and 70 feet on the west, giving it a better opportunity to show its beauty.

The principal improvements in Brooklyn were the new large sewers and the

beginning of the work on the approaches to the new bridges.

The rapid growth of the Bronx required many new improvements and steps have been taken by both the New York Central and the New Haven railroads to eliminate the grade crossings within the city, as well as without.

The Borough of Queens is still in the stage of topographical surveys and platting, and will very soon require deep study of its drainage and sewerage problems, which are exceedingly difficult.

The Borough of Richmond still has only unimportant work on hand.

Mr. Lewis recommends that the Boroughs of Queens and Richmond take up the location of parks before their areas are all platted and that Brooklyn consider the location of small parks and playgrounds in districts not yet built up, on the ground that the purchase, plus carrying charges, will cost less than purchase in the future when the parks become necessities.

The usual statistical tables giving details of plans presented accompany the report, also a report of the progress of the primary and secondary triangulation of the city by the United States Coast and Geodetic Survey, under an arrangement between the city and the survey.

Annual Report of the City Engineer of Minneapolis, Minn., 1904. Andrew Rinker, City Engineer.

The total expenditures under the city engineer's department for 1904 are $1,727,054, and the engineers' expenses for overseeing the work were $30,406, according to table No. 1 of this report, and $1,459,159 of which $35,815 was expended on the engineers' office, acording to table No. 4, but the two tables evidently are not prepared in the same manner, and while they have many items in common, each has some not in the other.

The report consists entirely of 52 tables, which give great detail of information about all the city's work.

The city is a large user of lumber, some 532,000 feet having been used in repairing dirt streets and nearly 60,000 in sidewalks; sewers, bridges and processes of construction requiring more than a million feet in addition. The public improvements completed under the city engineer since 1890 have cost $16,730,000, including 107 miles of pavement, 194 miles of curb and curb and gutter, 191 miles of sewers, 299 miles of water mains, some $2,000,000 for the water works plant and $2,300,000 for bridges, nearly all of the latter amount being for one bridge over the Mississippi, $1,116,000, and bridges over or under railroads, $1,010,000.

The streets are now paved as follows: Cedar block, 33 miles; brick, 17 miles; sandstone, 15 miles; asphalt, 12 miles; macadam, 12 miles; granite, 11 miles; creosoted wood, 7 miles. Thirteen miles were laid in 1904, the popular pavements being creosoted wood and brick, over half of the total being divided between the two. No new streets were asphalted, although 189,000 square yards of old asphalt and cedar block were replaced by asphalt pavement.

Of the million feet of sewers, 278,000 feet are vitrified clay pipe; 171,000 feet are cement pipe, 524,000 feet are of brick, 18 to 96 inches in diameter, more than half being 24 inches; 5,500 feet are reinforced concrete, 60 to 78 inches in diameter, and 29,000 feet are sewer tunnels. All the reinforced concrete sewers were built in 1904.

Thirty-nine miles of cement walk were laid in 1904.

The city sprinkles its streets. The average team sprinkled for 12,919 linear feet of assessed frontage, which paid 4.58 cents a foot. Street cleaning, all of which is not included in the table, averaged 9.06 cents a square yard a year.

There are now 57 miles of bicycle paths in the city, of which 2.4 miles were constructed in 1904 at a cost of $1,028. It cost $4,118 to keep up the old paths, and 4.5 miles have been removed.

Seventeen miles of water mains were laid in 1904, of 6 to 30 inch sizes, costing $226,684. Two pumping engines were tested during the year and full data are given.

Lighting, railway, power, telegraph and telephone companies laid 41,220 feet of conduit, containing 207,742 feet of ducts during the year. The total in use is now 117 miles of conduit and 643 miles of ducts.

Annual Report of the Water Department of Woburn, Mass., 1904. R. E. Walsh, Water Registrar.

The water commissioner, E. F. Hayward, calls attention to the necessity of replacing the old pumps now in use, of increasing the supply by putting down new wells, of lining the reservoir with concrete, and of replacing some mains. It seems that a number of breaks in mains have been attributed to strokes of lightning, due to the grounding of telephone lines by connecting them with water pipes. Supt. R. F. Spencer makes these recommendations more specific and reports the work done during the year.

The registrar makes the financial report. Notwithstanding the fact that the works have not been credited with hydrant rentals and water for schools, the receipts of $46,742 were sufficient to pay the maintenance and operation, $16,916, and interest, $1,652, and apply to sink-

ing fund, $27,687. The consumption per capita of the 14,200 persons supplied was 87 gallons for domestic purposes and 100 gallons for all purposes, in 1904. The bonded debt is now only $19,700, so that the needed improvements can be made and paid for in a very few years from the surplus. The consumers of water are paying too much for water and the city at large is paying too little.

The report is made in the standard form.

Tenth Semi-Annual Report of the Sewerage and Water Board of New Orleans, La., last half of 1904. Martin Behrman, Pres.; Geo. G. Earl, Gen. Supt.

The maintenance of drains is an increasing charge on the board, and it finds itself in the usual condition of boards dependent on city councils for appropriations and never has enough money to do the work completely. A good case is made in the report and should have some effect upon the council. One good recommendation which has not yet been heeded is the setting aside of a sinking fund of $30,000 a year to replace the machinery, buildings and other structures as they wear out. The complaints of overflow of drains have been traced to stoppage of inlets to them by street debris of all kinds. One advance demands another and, although the report does not definitely recommend it, the next requirement is evidently more strict regulation of the littering of streets and more thorough and frequent cleaning of them that the full benefits of the new system of drainage may be enjoyed.

The drainage pumps are now operated by engines, using oil for fuel, and are satisfactory, combining economy and efficiency.

The sewerage system is now under construction, 90 miles of the 115 miles completed having been laid in 1904. Other contracts are still under construction.

The case involving the use of puzzolan cement in contract "F," was compromised by the contractors paying the cost of the litigation, $500. Judgment was obtained against the National Contracting Company in what is known as the cement case, for $28,390, but the case has been appealed to the U. C. circuit court of appeals. The judgment was for $23,000, the difference in cost of the cements used and that contracted for, and costs.

The disbursements of the board during the last half of the year for payrolls, sewerage and drainage contracts and interest, were $922,296. Operation of the drainage system cost $33,200 and maintenance cost $3,542.

The total cost of the storm water drainage system has been $4,866,323. An additional appropriation of $700,000, to be spent in the next two years, is recommended in this report.

The report of the general superintendent goes into some detail regarding the proposed new work in drainage, sewerage and water supply.

ORGANIZATIONS AND INDIVIDUALS

American Society of Municipal Improvements—League of American Municipalities—Technical Meetings—Personal Notes.

The American Society of Municipal Improvements.

The preliminary program of the twelfth annual convention of the American Society of Municipal Improvements has been printed and shows that this will be one of the most interesting and valuable of the conventions held by this society, which is noted for the high quality of its work. For the first time in the history of the society an exhibition of municipal supplies and machinery will be held, and place is provided on the program for due consideration of it.

The headquarters of the society are at La Corona Hotel, Montreal, and the sessions of the convention will be held at the Crystal Rink. The days from September 5 to 9, both inclusive, are well occupied with the convention and sightseeing.

The program of papers includes the

usual reports of committees, which are always of great value, the chairmen of the committees being as follows:

Municipal Data and Statistics—William Fortune, Indianapolis, Ind.

Municipal Franchises—James Owen, Newark, N. J.

Taxation and Assessment—N. P. Lewis, New York, N. Y.

City Government and Legislation—William S. Crandall, New York, N. Y.

Park Development and Maintenance—G. A. Parker, Hartford, Conn.

Review—C. C. Brown, Indianapolis, Ind.

Street Paving—C. D. Pollock, Brooklyn, N. Y.

Disposition of Garbage and Street Cleaning—B. E. Briggs, Erie, Pa.

Street Lighting—E. A. Fisher, Rochester, N. Y.

Water Works and Water Supply—D. W. Mead, Chicago, Ill.

Sewerage and Sanitation—E. S. Rankin, Newark, N. J.

Papers by other members are promised on all these subjects and one entire session will be devoted to descriptions of the public works of Montreal and its vicinity. The addresses of welcome will be given by Mayor H. Laporte, Hon. Lomer Gouin, prime minister of Quebec, and the presidents of the Board of Trade, the Chamber of Commerce and the Business Men's League.

On Wednesday there will be a review of the Montreal fire brigade, a reception by the mayor and council at the council chamber, a drive through the streets and parks, electric cars to Lachine and boat down the Lachine rapids, on Thursday afternoon a trip by train to Hochelaga, and on Friday and Saturday special trips to points of interest, of which a list is given in the program, including water works, garbage, asphalt, street railway and lighting plants, car shops, factories, McGill college, parks, cemeteries, public buildings, the mountain and the Victoria bridge.

Copies of the program, giving the arrangements for reduced rates on the certificate plan, local accommodations, places of interest and other information can be obtained of the committee on arrangements: President, A. Prescott Folwell, Easton, Pa.; second vice-president, John Barlow, Montreal; secretary, Geo. W. Tillson, Brooklyn, N. Y.; chairman finance committee, Alcide Chaussee, Montreal.

League of American Municipalities.

In addition to the list of excellent papers to be presented at the next convention of the League of American Municipalities, at Toledo, Ohio, August 23, 24 and 25, which was printed in the July number of MUNICIPAL ENGINEERING, the following have been announced: "What the Fire Accomplished for Baltimore," by Judge Oscar Leser, Baltimore, Md.; "Fire Department Water Supply," by Chas. A. Hague, C. E., New York city; "Street Cleaning," by Mayor Silas Cook, East St. Louis, Ill. The manufacturers of and dealers in municipal machinery and appliances will have an attractive exhibit, special provision being made this year for it. J. W. Flowers, of Toledo, is the chairman of the committee having the exhibit in charge. Full information about the convention will be sent by John MacVicar, secretary, Des Moines, Iowa.

Those who are now interested in municipal subjects from both the legislative and the administrative sides will find that the meetings of the L. A. M., at Toledo, August 23-25, and of the A. S. M. I., at Montreal, September 5-9, are conveniently set to continue their outings long enough to attend both meetings. The purposes of the two societies differ enough to cause many to choose which suits their purposes best, but there are others, such as mayors and heads of departments, who will find both societies interesting.

Technical Meetings.

The next convention of the National Association of Cement Users will be held in Milwaukee, January 9-12, 1906.

The next annual meeting of the Northwest Cement Products' Association will be held in Minneapolis, early in January.

The quarterly meeting of the Association of American Portland Cement Manufacturers was held at Atlantic City, N. J., June 11, 12 and 13. Those attending the convention represented the selling, manufacturing and executive branches of the business. Suggestions were made preliminary to the establishment by the Cement Manufacturers' Association of its own laboratory at some future date, for experimental work and testing purposes. Among the papers read were the following: "The Griffin Mill; Its Place in the Development of the Portland Cement Industry," E. C. Griffin; "Reinforced Concrete from a Commercial Standpoint," John G. Brown; "Air Separation in Portland Cement Grinding," George Emerick; "Hollow Concrete Block Construction," Spencer B. Newberry; "The Townsend Improved Sprocket Wheel," A. Lundteigen. The association decided to add 5 per cent. to the present price of cement, to continue for at least six months.

The thirteenth annual meeting of the National Irrigation Congress will be held at Portland, Ore., August 21 to 24. Thomas Richardson, sec'y, Portland.

The annual meeting of the American Public Works Association will be held at Chattanooga, Tenn., August 30 and 31. W. H. Flint, sec'y, Chattanooga.

The June meeting of the New England Water Works Association was held at Attleboro, Mass., June 28. A trip was made to Ide's Hill to inspect the new water tower, which included a new well at the source of supply, constructed last year, and a reinforced concrete standpipe now under construction.

The date of the meeting of the International Association of Municipal Electricians is now set for August 23, 24 and 25, at Erie, Pa.

The American Society for Testing Materials held a very successful convention at Atlantic City, N. J., June 28 to July 1, and the Society for the Promotion of Engineering Education held its sessions at the same time and in the same city, one session being a joint meeting. The subjects of most interest to our readers are probably cement, timber and fire-proofing materials. The new things presented by the committees on these subjects will be reported from time to time in this magazine.

The American Civic Association, at its meeting in Cleveland, Ohio, October 4-6, will discuss factory betterment, parks, public libraries, Carnegie libraries, rural improvement, railroad improvement, road making, children's work, group plans in city making, first steps in improvement work, recent municipal improvements, woman's work for civic improvement and the year's work. J. Horace McFarland, Harrisburg, Pa., is president.

Personal Notes.

George Myers has been appointed city engineer at Iola, Kans.

E. S. Mendenhall has been elected county surveyor at Delaware, Ohio.

R. T. Fox has been appointed superintendent of street cleaning at Chicago, Ill.

W. A. Clement has been appointed city engineer, succeeding Thomas H. Tracy, at Vancouver, B. C.

J. W. Johnson has been appointed superintendent of the municipal water works at Oklahoma City, Ok.

Martin Lutz, present county surveyor of Mercer county, Ohio, has been appointed city engineer at Celina, Ohio.

J. B. Nichols has been appointed city engineer at Lorain, Ohio, succeeding Chas. S. Ferguson, who resigned.

Walter P. Moore has been elected superintendent of streets at San Diego, Cal., succeeding S. W. Hackett, resigned.

William E. Mahler has been appointed chief of the bureau of highways at Philadelphia, Pa., succeeding William H. Brooks.

Col. Thomas H. Tracy, who was city engineer of Vancouver, B. C., for fourteen years, has opened an office at 411 Howe St., as consulting engineer.

E. S. Ball has established an office at 1 Madison Ave., New York city, where he will act as constructing engineer for reinforced concrete and cement block construction.

George E. Carter, who has been superintendent of the water department of Chicopee, Mass., for the last six years, died suddenly of heart disease, July 9, aged 41 years.

C. W. Raynor has established an office at 407 Jackson Block, Denver, Colo., where he will practice as consulting engineer, making a specialty of city and county bridges for highway traffic.

Harry N. Croll, M. E., for the last eight years with the E. P. Allis Company and their successors, Allis-Chalmers Company, of Chicago, has resigned and accepted a position with the Wellman-Seaver-Morgan Company, of Cleveland.

W. A. Stadelman, eastern agent of the Wellman-Seaver-Morgan Company, who has had charge of the office at 42 Broadway, New York city, has been appointed general sales agent of that company, with headquarters at Cleveland, O.

Prof. Charles G. Hyde, professor of sanitary engineering in the civil engineering department of the University of California, has gone to Berkeley, after nearly a year spent in investigating municipal sanitation in various cities of the country.

Charles A. Bowman, division engineer on the Metropolitan waterworks for the last ten years, has resigned and entered the engineering firm of Morrison & Farrington (Inc.), general engineers, Dillaye bldg., Syracuse, N. Y.

McCarthy, Starns & Co., Lufkin, Texas, have organized for the purpose of conducting a general designing, constructing and consulting business, and succeeding the firm of P. A. McCarthy & Son. J. P. Starnes, C. E., becomes a member of the new firm.

Robert McDowell has been appointed superintendent of highways and sewers at Altoona, Pa. The department of highways and sewers and the department of surveys have been merged in the department of public works, with Andrew Kipple as chairman.

Fred Charles has been appointed city engineer at Richmond, Ind., succeeding H. L. Weber, who resigned recently to become chief engineer of the Ft. Wayne & Wabash Valley Traction Co. and of the Ft. Wayne, Bluffton & Marion Traction Co., with headquarters at Ft. Wayne.

John W. Hill, until recently chief engineer, and Henry C. Hill, first assistant engineer, of the Bureau of Filtration, Philadelphia, have resumed professional work as consulting engineers and experts for works of public water supply and other public utilities. Their temporary address will be 718 Fidelity Bldg., Philadelphia.

MACHINERY AND TRADE

Artistic Cement Stone in Milwaukee.

On a recent visit to the city of Milwaukee, Wis., we had the pleasure of seeing a number of handsome buildings erected of stone, made by the National Building Block Machinery Company's process. They make the thickness of the wall with two blocks, called the two-piece block system, by which the exterior and interior walls are firmly bonded and tied together in such a manner as to make a very firm and rigid wall, in which there is no connection between the interior and exterior, thus obviating any additional expense in the way of water proofing or facing blocks.

The aim of the successful concrete manufacturer is to produce a product to place in the market with profit to himself and satisfaction to his purchaser. Mr. J. P. Sherer, of the National Building Block Machinery Co., informed us that it has been their purpose to demonstrate thoroughly to their own satisfaction the utility of the products of their molds before offering them to the public. They are well versed in concrete construction, having manufactured stone by the wet process, semi-dry process, and what is known as the dry mix. They now offer for sale their molds, which make a very artistic and practical stone, and have demonstrated to them their practicability and utility.

Many architects and the public complain of the artificial look of the stone made by many of the ordinary block machines, and it has been Mr. Sherer's desire to produce stone as true to nature as possible, and of various sizes and styles, so that even the quarrymen themselves can not detect this artificial from nature's product.

He has a beautiful art catalogue which shows many of the styles and kind of the stone they make.

From the standpoint of one of the oldest block manufacturing concerns in the country, he has had ample opportunity to demonstrate to his stockholders the making of cement stone with profit. He also explains that a factory with a large capacity per day can be installed with very little expense, the stone being made on wooden pallet boards which replace the expensive iron bottom plates, used by so many of the larger one-piece machines. They also have an enormous demand for veneering blocks, used in place of pressed brick, for facing in many large structures, which certainly present a very handsome appearance.

We would advise those anticipating engaging in the manufacture of concrete stone to address the National Building Block Machinery Co., of Milwaukee, and ask them to forward a booklet from which a great deal of valuable information relative to this new and fast-growing industry can be obtained.

The Detrick Building Block Machine.

One of the latest concrete block machines on the market is one invented by D. F. Detrick, and manufactured by him, at 40 Potomac St., Dayton, Ohio. The accompanying photograph shows the style of the stones turned out on this machine in broken ashlar, and equally good work is promised for moldings of all sorts, arch work and difficult art-stone work generally. The capacity claimed for the machine is 1,000 "plural" stone in ten hours. The blocks are made face down, the machine is turned over on a wooden pallet for removal of block. Mr. Detrich states that he now has more than a thousand orders for the machine, and as his price is low, and the quality, if the photograph may be taken as an indication, is good, his business should continue to increase.

Wing's Disc Fans.

For any movement of air or gases, Wing's disc fans have been standard apparatus for many years. There are many reasons for this, some of which are stated in the catalogues of the L. J. Wing Mfg. Co. substantially as follows:

The blades are curved and have an expanding pitch, thus increasing the amount of air moved and reducing the slippage over other places. The blades are adjusted to the conditions. The expense of operation is low and there is no danger of accident. Because of light weight and convenient form the fan can be placed in any desired location. It is noiseless and does not obstruct the light. It seldom or never gets out of order. It costs no more than fans with fewer advantages.

WALL OF DETRICK HOLLOW BLOCKS.

The company will send booklets descriptive of special uses of fans and methods of setting and using them, also a long list of firms using them for ventilating, heating, refrigerating, drying, removing objectionable odors and gases, etc.

The company also manufacture acetylene gas generators and have taken up the business of erecting town and city acetylene gas or electric lighting plants. Some very interesting statements as to the value of acetylene gas for lighting, and for cooking, are made in the booklet devoted to this branch of their business. Send for it at their address, 136 Liberty St., New York city.

Palmer Concrete Blocks on the Panama Canal.

The Isthmian Canal Commission has purchased of the H. S. Palmer Co., of Washington, D. C., quite a number of their new automatic hollow block machines, for use on the isthmus, with instructions for Mr. H. S. Palmer to go with them, or send whom he wished. He was fortunate to secure the services of Mr. J. D. Wood, who for the past two years has been operating Mr. Palmer's machines, erecting some of the largest buildings in the world of hollow blocks with them. Mr. Wood received his commission and sailed on the 10th of July for the isthmus with the first lot of machines to be used in building houses for officers and workmen along the canal zone. Mr. Palmer will go later.

The Branch Garbage Incinerator.

The Branch garbage incinerator, which is manufactured by the National Equipment Co. of St. Louis, is the invention of Joseph G. Branch, Chief Inspector of Boilers and Elevators, and member of Board of Examining Engineers for that city, whose inventions are being used in almost all steam plants.

The Branch incinerator is composed of two separate units or furnaces, set at right angles to each other, and so connected by a by-pass that either one or both can be fired, and the waste gases therefrom led under a battery of boilers before escaping into the stack.

The first furnace, or "A," (Fig. 1), is so connected with the second furnace, or "B," that the heat and gases therefrom are fed into the second furnace at a point immediately in the rear of the bridge wall, before passing into the boiler furnaces and out through stack.

This not only insures complete combustion and destruction of all offensive gases, but gives an even distribution of heat throughout the entire furnace, thus insuring the complete destruction of all garbage dumped into the rear end of furnace, the same as nearer the fire.

The two furnaces, "A" and "B," are provided each with two separate sets of grate bars, one immediately above the other. The garbage is dumped through hoppers upon hollow garbage supporting grates, which run transversely from side to side, being inclined downwardly. (Fig. 5.)

These water grates are connected on the sides to two headers, and in the center to a single larger header. Through these headers and connecting water grates the feed water is pumped to the boilers, thereby securing a positive circulation, and preventing the grate bars from burning out. This also does away with the necessity of a feed water heater, delivering the feed water at boiling temperature to the boilers.

The advantage of having these grates downwardly inclined is to bring the garbage to the center of furnace, which is the hottest point, and at the same time prevent the clinkers from coming into contact with the sides of the highly heated furnace to which they will adhere.

The two upper headers are connected in the rear of each furnace by a "T" from which connection is made direct to the boilers.

To the lower header the pump connection is made, into which the cold water from the city main, or other source of feed, is pumped.

The water grates are expanded into the upper headers, having first been threaded into the lower or middle header, thus exposing only one threaded joint of each grate to the direct heat of the gases.

The fire grates are of the ordinary kind used for firing coal, all made interchangeable throughout. On the sides of the garbage furnaces are openings for stoking the garbage. In the ash pit under the lower garbage grates swill pans are inserted, into which the liquid garbage thrown into the hopper above is run, and which is evaporated by the heat of the furnace itself, passing out with the other gases. These pans can be readily removed for cleaning.

There is an offset, or break, in the rear of each furnace, thereby forcing the gases from the upper garbage grates to pass down into the lower furnace before passing out. By this means the unconsumed gases from the upper, cooler and shorter garbage furnace are forced down into the hotter and longer furnace below, where the two are mingled and entirely consumed before being discharged from

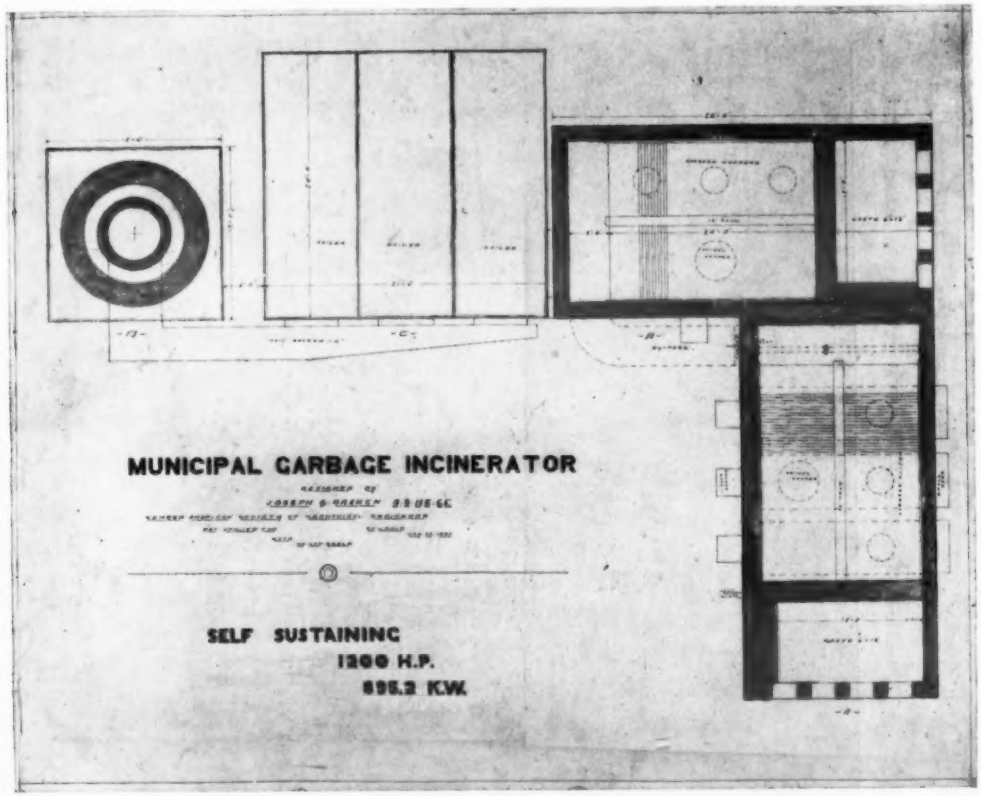


FIG. 1. BRANCH GARBAGE INCINERATOR.

the first furnace into the second, or from the second furnace into the boiler furnaces, thus insuring more perfect combustion and greatly aiding the draft. By introducing the heated gases immediately in rear of bridge walls, both the combustion and draft are greatly increased.

Either natural or mechanical draft can be used, though the latter is preferred, using steam jets.

All parts are interchangeable and can be bought in the open market.

Any type of boiler can be used, the headers and water grates being similar to those used in the ordinary down draft furnaces.

The principal advantages claimed are no odor or dust, no sorting or handling of garbage at plant, no garbage dumped on fire or fire brick, no auxiliary furnace

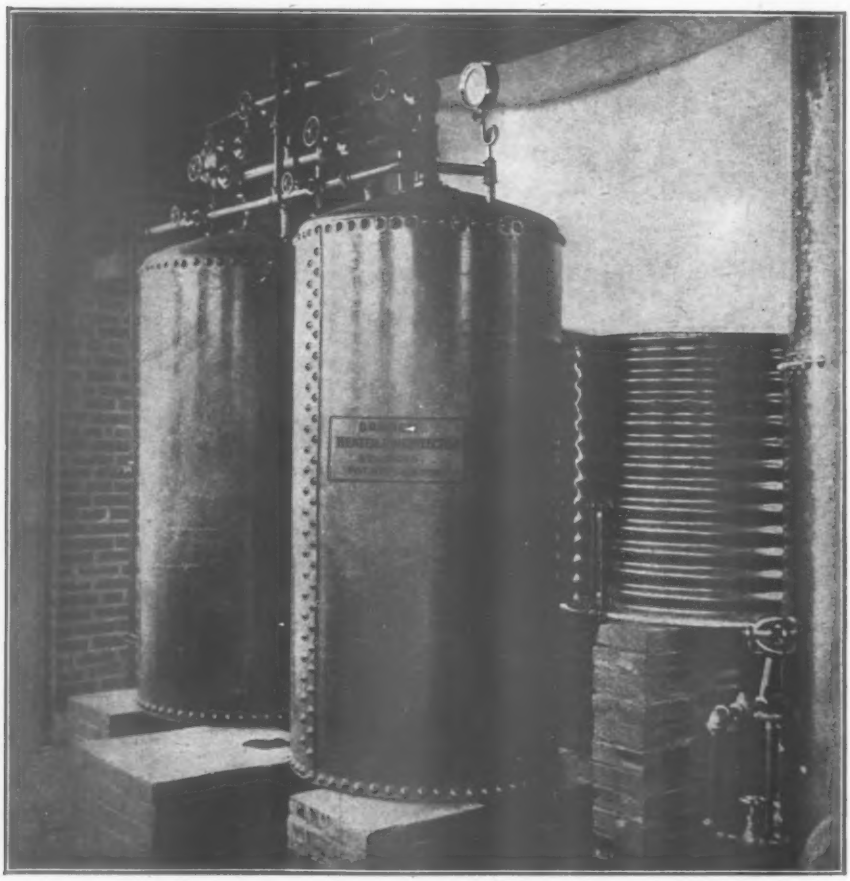


FIG. 2. BRANCH GARBAGE WAGON WASHER AND DISINFECTOR.

The entire structure is enclosed in a sheet-iron casing, using angle irons.

A platform extends over the furnaces onto which the garbage carts are driven, and the garbage is dumped direct into the furnaces.

This incinerator can be built in single or double units, of any capacity desired, and insures the incineration of garbage of every character, including dead animals and night soil. Suitable sizes are made for hospitals, etc.

or checker work necessary, no fire brick or tile used for garbage grates, as the liquid garbage soon cracks the highly heated tiles, no uneven distribution of heat in furnace, smallest number of threaded joints exposed to fire and heated gases, no clinkers brought in contact with the highly heated walls of the furnace, to which they will adhere, all garbage within sight and easy reach of the stokers, no water jackets used, or stay bolts, complete and positive circulation

through water grates and ease of access to same at all times.

All waste heat is utilized for power purposes.

Tests show the following results: Refuse consumed per square foot grate, per hour, 67 lbs.; water evaporated per pound of refuse from and at 212 degrees Fahr., 1.8 lbs., average temperature of feed water being 63.4 Fahr.; i. h. p. per ton of garbage burnt in 24 hours, 8; coal consumed per ton of garbage, 90 lbs.; average temperature of furnace, 2,000 degrees Fahr.; lowest temperature, 1,500 degrees Fahr.; average steam pressure, 115 lbs. per square inch.; forced draft pressure, 1.8 degrees water; steam consumption of jets, 12 per cent.

The following is an approximate estimate of the light and power obtained from a 150-ton incinerator: 1,200 h. p. equals 895.2 k. w.; allowing 92 per cent. efficiency and 11 per cent. loss, equals 603,556 watts, or 150,889 c. p., which permits 9,340 16-c. p. lamps, or 4,716 32-c. p. lamps, or 336 2,000,c. p. lamps.

Where waste gases are not utilized, the estimated cost of operation, with coal at $2 per ton, is: Garbage incinerated at 9c per ton; labor, 10c per ton; total cost of incineration per ton of garbage, 19c; daily cost (24 hours), 150-ton incinerator, $28.50. Sale of garbage ashes should pay cost of all necessary repairs.

In addition to the Branch incinerator, this company is placing upon the market the Branch wagon washer and disinfector, as shown in the accompanying cut (Fig. 2), the special features of which are set out in the following letter from the street commissioner of St. Louis:

The garbage wagon washer and disinfector designed by you for the use of this department has been in operation since April 1, 1905, and is giving perfect satisfaction. With the washer we can heat 300 gallons of water to 200 degrees Fahr. in seven minutes, and by using the two tanks alternately, we always have an abundant supply of water. It cleanses and disinfects the wagons perfectly, requiring about 30 seconds to a wagon.

For any additional information, write to the National Equipment Co. of St. Louis, who own all patent rights, except for the city of St. Louis.

Miracle Sidewalk Tile Machine.

The Miracle sidewalk tile machine consists of a square mold, planed perfectly smooth and square inside, attached to an iron stand, which is fitted with a foot lever for raising the tile after finishing, as shown by the accompanying illustration. The different sizes, 12, 14, 16, 18, 20 and 24 inches square, are made on the same machine, it being necessary only to change mold, which operation can be accomplished in a very few minutes.

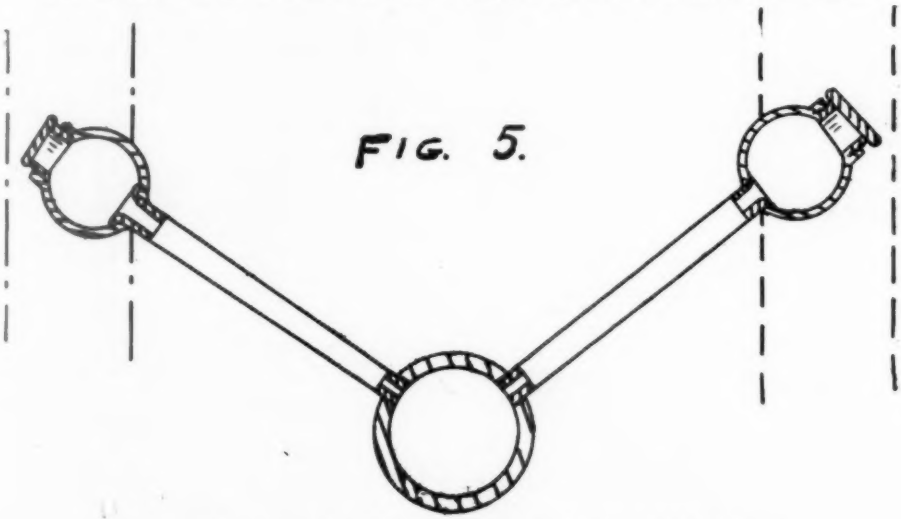


FIG. 5. WATER GRATE BARS OF BRANCH GARBAGE INCINERATOR.

The machine is strong and well made, all bearing parts are planed to fit accurately, and the mechanism is so simple that there is absolutely nothing to get out of order or wear out.

The molds can be used separately if desired, by making a wooden stand or table, but, considering the low cost of the iron stand, its durability and its adjustability to all sizes of molds, it is much cheaper and more satisfactory than a home-made affair.

The molds are cast in one piece, are heavy enough to be perfectly rigid, and,

being planed perfectly true and smooth inside, insure a tile, perfect in every respect. By having a different mold for each sized tile, a perfection is obtained which can not be accomplished by machines using fillers in a large mold of wood or other material.

Miracle cement tile walks are preferred in many places for several reasons. It is contended by some that where the temperature is subject to extra changes, the tile walk is superior, inasmuch as it will heave in blocks and is not liable to crack. The tile can be made in winter when labor is cheap. Another advantage in laying a walk of Miracle tile is that it is not necessary to stop traffic. A walk surfaced in place must be enclosed for several days to cure, while a Miracle walk is ready for use as soon as laid.

The molds are made in the above-named sizes. However, it is not necessary to have all of them. The popular sizes are 20 and 24 inches, as the 20-inch tile, laid three wide, make a five-foot walk, and the 24-inch a walk of any width in even feet.

The Miracle company have been engaged in the construction of cement walk

MIRACLE SIDEWALK TILE MACHINE.

in the Northwest for the past eight years and this machine is evolved from their experience in the business.

With each machine they furnish complete specifications for the manufacture and laying of cement tile walk. A letter addressed to the Miracle Pressed Stone Co., Nicollet Island, Minneapolis, Minn., will bring full and specific information about this tile machine, or any tool or machine used in the concrete business.

The Iowa Concrete Block Machine.

The Iowa building block machine will mold blocks any height from 1 to 8 inches, and any width from 8 to 16 inches, without changing a side or an end plate. It will mold fractional, corner and octagon blocks for every size above mentioned; also chimney blocks and porch piers of any size, from 8 to 16 inches square and up to 16 by 24 inches, and circular blocks of any radius. Plates for

IOWA BUILDING BLOCK MACHINE.

circle 12 feet in diameter are furnished. It will mold veneering blocks 4, 5, 6, 7 and 8 inches thick, with fractional sizes and corners. Wood or iron bed plates or pallets can be used. All blocks of the same width, except circular blocks, are made on the same bed plates. The machine will not spread with heavy tamping, the mold box is planed up true and square to shut absolutely tight at the corners, and does not leave a feather edge on the corners of the block. They are square and clean cut. The side plates will not mutilate the face of the block in opening the machine and will not break the block in delivering it. The machine is automatic, requiring but one movement of one lever to open or close it.

The cores are stationary and different sizes for the different blocks are furnished with each equipment. There are no cogs or gears to clog or wear out, and the company's motto in manufacturing the Iowa is "simple, practicable, durable, fast."

The company have confidence in the machine enough to ship it to responsible parties for trial, and if the machine fails to do what they claim for it, and fails to satisfy the customer, they remove the machine without any expense.

The practicability of the machine ap-

peals at once to every practical man, and the company is enjoying a good, healthy trade, having shipped the Iowa into nearly every state and territory. They have a well-equipped factory, employing only skilled labor, and are able to make prompt shipments. Descriptive catalogues of the Iowa will be sent upon inquiry, by the Iowa Building Block Machine Co., Waterloo, Iowa.

The Dunn Hollow Concrete Block Machine.

According to the catalogue of the Dunn hollow block machine, which has just been issued by the Superior Cement Machinery Co., 183 E. Washington St., Chicago, Ill., there are fourteen points of advantage in the machine, and a personal examination of the machine shows that the catalogue is very close to the facts. The points and the arguments for them are as follows, abbreviating somewhat the statements in the booklet:

It is easily operated. To make a block lay pallet on machine and mold casing on pallet; shovel in concrete and tamp until filled, level off and smooth with trowel. Step on treadle and block mold and pallet is loosened from core and raised. Then pick up and carry away. Place same on ground wherever it is to set and harden—pull out one pin and by a simple movement remove casing and you are ready for next block.

1. DUNN BLOCK MACHINE.
Filled with concrete.

It combines many machines in one, a large variety of blocks of different size and shape can be made.

Speed. One man picks up pallet, mold and block. He does it quickly and walks away with it without danger of spoiling or breaking block. The other man's time (if two are working) can be used to advantage starting another block. Blocks are quickly made, as no time is lost in removing cores, releasing block, etc.

Portable. On account of its compactness and moderate weight this machine can be moved to any job.

Height. The machine is just the proper height to work to advantage and therefore it is not necessary to stoop down in lifting block or overlift shoveling in the concrete.

2. DUNN BLOCK MACHINE.
Removing block in casing.

No broken or defective blocks. When the newly formed stone is removed from the machine it is protected by the mold until it is placed where it remains to harden. By this method extreme care in handling unset blocks is not necessary and a clean, sharp cornered and true shaped block is insured. It also permits the use of a wetter mixture, consequently a stronger and better stone.

Variety of blocks. It makes regular blocks with five different facings; solid and veneer blocks any thickness up to 12 in.; hollow blocks from 6 to 12 in. thick; corner blocks either hollow, solid or veneer; 45 degrees angle blocks for bay windows; steel-bonded blocks, water tables, chimney blocks, etc., in any length up to 20 inches. Equipment includes face plates in two designs, for making caps and sills up to 60 inches in length.

Blocks Easy and Inexpensive to Lay. The regular stretcher block has bridges connecting the front and rear, which are 2 inches from the end and have a recess underneath enabling one man without helper to easily lift it, move and place the block in exact position in the wall with one movement without crowding or injuring the hands.

Continuous air space. The bridges and

end recess prevent a continuous mortar joint from front to rear. They also make a continuous air space in wall, both vertically and horizontally, and so require no furring or lathing.

Block is proper size. The size of the Dunn block, 20 inches long, is suitable for large, medium or small buildings. A 16-inch block takes less than a man, while a 24-inch or 32-inch block requires more than a man.

3. DUNN BLOCK MACHINE.
Removing casing from block.

Face measurement of block. Surface measure of Dunn block is 19 3-4x7 3-4; allowing 1-4 inch for mortar joint makes 20x8.

Hollow or core openings. The core openings can be made at the ends, the center, continuous as in the steel-bonded block, toward the front or near the rear of the block. Not a second is lost in making this change.

Steel-bonded block. This block consists of front and rear slabs of concrete bonded together by steel or iron rods solidly imbedded in the concrete. A wall of these blocks has one continuous air space, making a wall that is dry and absolutely impervious to heat, cold and moisture.

Facing blocks. Blocks can be faced on this machine by using a thin layer of rich concrete, which adds to the beauty and moisture resisting power of the block. Facings can be colored to imitate the natural stones if desired. There are a number of ways by which blocks can be faced on this machine. One method is by using a different plate, which is included in outfit. Full instructions as to the different ways of making facings with different colors and materials will be furnished with the machine on request.

The pallets are of wood of special form and bracing, one of the patented features of the process, and are inexpensive, permanent in form and durable.

The catalogue contains some excellent pointers on the concrete block business.

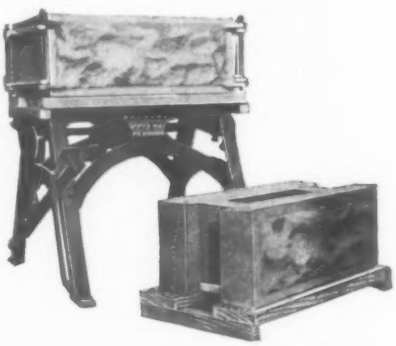
The Shape of the Mold as a Factor in Making Concrete Blocks.

The following is contributed by Mr. H. S. Palmer as an addition to the discussion of the best way to make good cement blocks. It opens the question of the form of the molds for discussion and may prompt some other block maker to report his experience, whether it agrees with Mr. Palmer's statement of principles or not:

The philosophy of making good artificial stone by hand and even better than can be done by hydraulic pressure is very simple, but from such information as can be gleaned from the advertisements of hollow block machines is little understood, and to this may be attributed much of the trouble in question about damp houses when plastered directly upon the walls.

This is only one of many faults which are coming to light as the novice gets in his work, but in justice to the industry it is, perhaps, best to inform the public that if it employs incompetent workmen who use still more incompetent machines, they must always expect trouble from one source or another, and it must also be understood that experts, as a rule, are not anxious to divulge all the points which they have learned by long experience, and when some "three or four year old" begins to elaborate on what he knows about artificial stone or building with hollow block it is well to shun him as well as his theories.

But the fact is recognized that tamped stone is the best if it has been properly done, and obviates many serious difficulties otherwise unavoidable. But all tamped stones are not alike and some are worthless, so that proper rules must be



4. DUNN BLOCK MACHINE.
Finished block on patent pallet on floor. Casing in position to make another block.

observed at all stages of the process. One in particular is very essential, and this one I will explain.

To begin with, the mixture must be exactly right in all details, which can not be taken up in this article, but especial attention is called to the consistency of the concrete at the time it is put into the mold. As an illustration, take the painter applying gold-leaf. He does no work haphazard, by putting on the varnish and

then the leaf. See how he carefully watches for the right consistency of the varnish as it dries, so as to properly hold the gilding. Just so with the best operators in artificial stone. The mixture must be right, and in addition the mechanical means must be correct. The desideratum in this respect is the ability to compact the mass into the smallest space possible and hold it there. The ramming of the mixture in an open box or mold can not give that density which is necessary for waterproof work. This can be illustrated by the manner in which sidewalks are tamped, and the only way to make waterproof work in such cases is to add enough cement, which is prohibitive by the additional cost.

Every one knows the power contained in the well-known principle of the wedge, and the best results in compacting the artificial stone mass are on this same principle. To accomplish this the mold must be smallest in the bottom, the walls somewhat inclined and not too far apart.

Taking for granted that the mixture is in just the right stage to retain its position under the repeated blows of the rammer, it is shoveled into the mold and pounded down between its inclined walls, which grip the material like a vise, each blow, adding to that already given and retained, in connection with the sticky condition of the right mixture, compacts the mass to the smallest space, and the density, strength, porosity and lasting qualities of the stone thus produced are greatly enhanced as well as a more even and uniform color with less liability to efflorescence and cracking.

A stone made in a mold whose walls are twelve inches apart can not be compacted to the degree of one whose walls are only three inches apart and properly inclined. It was this favorable feature which aided very materially in making hollow blocks a success, because when the cores were in position the thickness of the walls of the stone would be the most advantageous for ramming. This, in addition to the tapering cores, produced the wedge-shaped mold and the ideal conditions for perfect stone.

It is this principle which explains why better impressions are given to the stones by the sides of the mold than can be obtained from the bottom. With these features all properly combined there is no reason for the great commotion in all the papers about damp buildings, efflorescence, and the thousand and one troubles which people are clamoring about without any knowledge or adaptability to the business.

Of course, with the best machines many will make failures at first and with the poorest machines some will get comparatively good results; but it is greatly to be desired, as far as the industry goes, that nothing but the best should be put out and proper instructions given for the purpose of education. There is no reason for poor stone and poor buildings, and in time this work will not be tolerated by the public, any more than it is at the present time by those who know what good work should be.

Trade Publications.

Norton Mattocks has prepared a handsomely illustrated description of the Duluth aerial ferry bridge, the only one of its kind, and those who are interested in the structure can secure copies by applying to the City Engineer of Duluth, or to the Duluth Engineering Company, the consulting and supervising engineers.

The Morris Machine Works, Baldwinsville, N. Y., issue Catalogue No. 11 of centrifugal pumps.

The Compagnie Generale de Constructions Incombustibles of Montreal, Can., send a booklet about reinforced concrete and showing a number of structures constructed on the Goffette system, which they are introducing in this country.

A booklet is issued by the committee on pig iron of the New York Produce Exchange, explaining the system of warrants and certificates whereby pig iron in any locality may be conveniently bought and sold on the exchange.

The Browning Engineering Co., Cleveland, Ohio, describes locomotive cranes in its Bulletin No. 19.

The Koerting gas engines, now made up to 3,000 horsepower, are described in a handsome catalogue issued by the DeLa Vergne Machine Co., New York city.

An excellent book of "Instructions to Agents" is issued by the Municipal Engineering and Contracting Co., 607 Railway Exchange, Chicago, Ill., which goes into detail regarding the materials of concrete and the method of mixing them, with special reference to the efficiency of their cube mixer. Copies can probably be obtained on application to the company.

Two recent pamphlets, issued by Warren Brothers Company, contain official reports of city council committees of Sheboygan and Green Bay, Wis., and Iowa City, Iowa, recommending its use in their cities as the result of their investigations in other cities, and a record of failures of pavements laid in imitation of bitulithic in several cities, the latter pamphlet bearing the title, "As Good as Bitulithic."

Jeffrey screens are shown in a supplement to Screen Catalogue No. 69 of the Jeffrey Mfg. Co., Columbus, Ohio.

The Sargent Steam Meter Co., First National Bank Bldg., Chicago, Ill., issue a booklet descriptive of their steam meters, angle-meters and draft gages.

Bulletin No. 10 of the DeLaval Steam Turbine Co., Trenton, N. J., gives a description of the works and product of the company and a sketch of the inventor of the turbine.

The Trinidad Asphalt Mfg. Co., St. Louis, Mo., send one of their bull-dog paper weights as a desk reminder of their bull-dog brand of asphalt roofing.

The Winner Block Machine Co., 1 W. 29th St., Minneapolis, Minn., issue a folder illustrating their concrete mixer and a complete plant for making concrete blocks, 150 Snediker Ave., Brooklyn, N. Y.

The Hotchkiss Concrete Stone Co., Chi-

cago, Ill., advertise their products in a neat booklet.

Gem Cement Tools are illustrated in Catalogue No. 1 of the Kramer Bros. Foundry Co., Dayton, Ohio.

The U. S. Wood Preserving Co., New York, issue a handsome catalogue showing streets where their blocks have been used.

Barrett's Review for the summer of 1905 has been received.

Ransome concrete mixers, 1905 model, are shown in an attractive booklet.

N. F. Palmer Mfg. Co. issue a catalogue of "Donts" about concrete building blocks.

The National Equipment Co., Holland Bldg., St. Louis, Mo., in their catalogue No. 4 illustrate the Branch furnace burners and oil heaters, for natural gas, illuminating gas and various kinds of oil and for various uses in furnaces, house heaters, automobiles, etc. In Bulletins No. 12 and No. 14, they describe the Branch steam trap and the National boiler compound. Other circulars set forth the advantages of the Branch municipal garbage incinerator and garbage wagon washer and disinfector.

Trade Notes.

ASPHALT.

Dayton, Ohio—The purchase of an asphalt repair plant is being considered.

Wauchula, Fla.—A company has been organized in this city to purchase the asphalt sidewalk outfit of U. V. Wilder, who has contract for building asphalt sidewalks in this city. The new company is composed of W. H. Kayton, W. E. Mitchell, A. G. Smith, W. A. Southerland, T. R. McRae, L. F. Stephens, M. C. Kayton, Stenstrom Bros., Beeson Bros. and W. H. Rue.

Toledo, Ohio—The Haughton Elevator and Machine Co. is building a one-car asphalt plant in this city. The plant is the invention of George Merriman, an asphalt man. It costs nearly $15,000. A company may be organized to manufacture more machines.

Oklahoma City, Ok.—The Western Consolidated Asphalt Co. has been incorporated by Alexander Hamilton, Edgar L. Rahls, Felix W. Carlisle, W. W. Braswell, of this city; Harper Hamilton, Rome, Ga.; Stephen Brown, Rush Springs, I. T.; C. W. Brown, Comanche, I. T. Plans for the plant have been completed.

BRICK.

Des Moines, Iowa—The Flint Brick Co. is making improvements preparatory to manufacture paving blocks.

CEMENT.

Hitchcock, Ok.—The Hitchcock Cement Works were destroyed by fire recently, entailing a loss of $85,000. It is not yet known whether or not the company will rebuild. Spontaneous combustion is believed to have caused the fire.

Wellston, Ohio—The Ohio Portland Cement Co. has been incorporated by J. A. Lockhard, L. F. Barnes, Grant McGhee, Michael Kreanie and D. Lenngooch.

Grass Lake, Mich.—The Michigan Mfg. & Mercantile Co. has been incorporated to manufacture Portland cement and building material, by Isaac N. Payne, L. C. Bidwell, Frank A. Vernor and Edward J. Foster.

Mitchell, Ind.—About sixty laborers at the Lehigh Portland cement mill went on a strike July 7, demanding an increase of wages from $1.30 to $1.50 a day. The main office instructed the local managers to make no concessions.

CONCRETE BLOCKS.

Washburn, Wis.—Sheridan & Palm will engage in the cement tile and cement sidewalk business here.

Pukwana, S. D.—J. A. Stranska has been granted a patent on a machine for making cement brick, cement building blocks and cement posts.

Minneapolis, Minn.—Pitts Bros. have established two machines, the invention of W. L. Dow, of Sioux Falls, S. D., at 2852 Hennepin Ave., to manufacture blocks for their new buildings.

Johnson City, Tenn.—The Harris Mfg. Co. is rebuilding and enlarging its plant in this city. The company has purchased a concrete block machine and will make the concrete blocks that will be used in the plant.

Grand Forks, N. D.—J. M. Sturtevant will engage in the manufacture of concrete building blocks.

Oshkosh, Wis.—The Oshkosh Concrete Construction Co. has begun the manufacture of concrete blocks by the Palmer process.

Eau Claire, Wis.—The Northwestern Steel & Iron Works will erect a new plant at once and will engage in the manufacture of concrete block machines.

Nashville, Tenn.—Special.—The School of Mechanical Engineering, Vanderbilt University, desires to put up a new main building and new chemical laboratory, of fire-proof construction throughout.

Lincoln, Neb.—Special.—J. H. Craddock, 10th and O Sts., advises us that they contemplate building two school houses of cement blocks.

Washington, Kas.—Special.—A company will be organized here shortly for the manufacture of sand and cement brick. Messrs. Cook and Horshine have commenced the manufacture of concrete blocks.

Beatrice, Neb.—Special.—Rutherford & Lee, mfrs. of cement blocks, cement and brick, laid a number of sidewalks last winter during freezing weather, which are said to be the best walks in the city. They used Bowen chemicals.

Waterloo, Ia.—Special.—The Iowa Building Block Machine Co. has recently installed machines for the manufacture of cement blocks in the plants of J. L. Borden, Sulphur, I. T., and the Burlington Lbr. Co., Palmyra, Mo. Messrs. Silvera and Gadsden, of Savannah, Ga., have been appointed southern agents for the company.

PURCHASE OF MACHINERY.

Portland, Ore.—Special.—John Kinnan, 155 16th St., advises us that he expects to do some work on canals and locks soon, and will be interested in the purchase of materials for reinforced work.

Freeport, N. Y.—Special.—A. S. Johnson advises us that he desires to purchase sidewalk tools.

Iola, Kans.—Special.—J. H. Ryan de-

sires catalogues and price lists of cement block machines.

Rhinebeck, N. Y.—Special.—August Van Keuren advises that he desires to purchase machinery and tools for all kinds of cement works.

Charleston, W. Va.—Special.—Pfaff & Smith are in the market for a 5-ton steam road roller.

Manistee, Mich.—Special.—S. P. Nielsen, 19 Filer St., desires to purchase cement or concrete mixer and sidewalk tools.

Baker City, Ore.—Special.—Fred Neuhaus, 2596 7th and Place Sts., advises us that he is in the market for a hollow block machine.

St. Paul, Minn.—County Surveyor Armstrong has recommended the purchase of a steam road roller of not less than 10 tons. His recommendation has been referred to the committee on roads and bridges.

Marion, Ind.—Special.—Michaels & Minnick advise us that they are in the market for a concrete mixer and ask that manufacturers send them catalogues.

Coudersport, Pa.—Special.—L. D. Horton advises us that he desires to purchase sidewalk tools, canvas, etc.

Merkel, Tex.—Special.—R. A. Miller advises us that he is interested as a possible purchaser in machinery for making concrete building blocks.

Mingo Junction, O.—Special.—Jerry Neville desires to purchase cement tools.

Frankfort, Ky.—Special.—C. Power advises us that he is in the market for cement block machinery.

Chicago, Ill.—Special. — George J. Byrnes, 434 Elm St., desires to purchase concrete block machines and concrete mixers.

Enid, Ok.—Special.—Chas. F. Cooter, box 743, advises us that he desires to purchase machinery and tools for concrete work and cement stone.

Montreal, Can.—Special.—R. S. Lee, Lee, room 221, Coristine bldg., desires to purchase a railroad contractor's plant and perhaps machinery and tools for concrete work.

Nashville, Tenn.—Special.—The School of Mechanical Engineering, Vanderbilt University, desires to put up a new main building and new chemical laboratory of fire-proof construction throughout.

Green Isle, Minn.—The business men of this city are talking of purchasing a concrete block machine.

West Hoboken, N. J.—Special.—Jos. J. Ruhl, 326 Smith St., desires to purchase machinery and tools for cement sidewalks.

Wilkinsburg, Pa.—Special. — F. M. Duke, 202 Center St., is in the market for machinery and tools for concrete foundations and cement and plaster work for buildings.

Brookline, Mass.—Special.—Henry A. Varney, 100 Davis Ave., desires to purchase pumps, gasoline engines and sewer siphons.

Muskogee, I. T.—Special.—B. G. Slaughter, 125 E. Okmulgee Ave., advises us that he is interested in the proposed purchase of concrete mixers. He also desires a practical stone man as partner.

Stratford, Ont.—Special.—Wm. Ireland, box 298, desires to purchase a cement block machine and a cement mixer.

Renfrew, Ont.—Special.—J. R. Stewart, box 105, desires to purchase tools for sidewalk construction, sewers and manholes.

Deerfield, Ill.—John P. Schneider advises us that he wants information about concrete block machinery.

Beloit, Wis.—Special.—Davidson Bros. are interested in the purchase of machinery and tools for the manufacture of cement roofing tile (shingles) and cement brick and cement mixers.

Milwaukee, Wis.—Special. — Gerhardt F. Stuewe, 308 20th St., desires to purchase machinery tnd tools for general contractors, and particularly for mason work.

Warren, O.—Special.—Thos. R. Coe, 237 Main St., is in the market for concrete block machinery.

Fort Worth, Tex.—Special.—W. G. E. Rolaff, 317-18 Ft. Worth Nat'l Bank bldg., advises us that he is in the market for crushers, mixers and pulverizers.

Aylmer, Ont.—Special.—Fred Holden advises us that he desires the addresses of people selling machines for making concrete blocks and small cement brick, of large capacity, with or without power.

Sault Ste. Marie, Mich.—Special—C. H. McIlharger, cy. engr., advises us that he is interested as a possible purchaser of road machinery.

Whiting, Ind.—Special.—Chas. Noef, box 438, is interested as a possible purchaser in cement block machinery.

Newburgh, N. Y.—Special.—Arthur J. Wills, of Broderick & Wind Engrg. & Const. Co., 67 Ann St., is interested as a possible purchaser in tools and machinery for building, quarrying, stone-cutting and general work.

New York City—Special—The Bell Engineering & Const. Co., 220 Broadway, advise us that they are interested as possible purchasers in machinery and tools for reinforced concrete and railroad work.

Brooklyn, N. Y.—Special.—W. L. Tremper, 1055 41st St., advises us that he is a possible purchaser of concrete block machinery and paving tools.

Wellsburg, W. Va.—George B. Sanders, box 32, desires to purchase a sheet iron mixing pan about 1-4 in. thick and 12x14 feet.

Lockland, O.—Special.—Wm. Griffin, 303 Mill St., advises us that he is interested as a possible purchaser in tools and machinery for curbs and gutters, sidewalks, concrete walls and all kinds of cement work.

PURCHASE OF MATERIALS.

Charleston, W. Va.—Special.—Pfaff & Smith are in the market for natural and Portland cements.

Baker City, Ore.—Special.—Fred Neuhaus, 2596 7th and Place Sts., desires to purchase cement.

Portland, Ore.—Special.—John Kinnan, 155 16th St., advises us that he expects to do some work on canals and locks soon, and will be interested in the purchase of materials for reinforced work.

Freeport, N. Y.—Special.—A. S. Johnson is in the market for concrete material.

Baker City, Ore.—Special.—M. P. White, arch., 1917 1st St., is in the market for building materials, etc.

Merkel, Tex.—Special.—R. A. Miller desires to purchase cement.

Mingo Junction, O.—Special.—Jerry Neville advises us that he desires to purchase cement.

Brooklyn, N. Y.—Special.—Jerry Tremper, 1055 41st St., desires to purchase cement, etc.

Buffalo, N. Y.—Special.—J. G. Ullman, C. E., 789 Ellicott St., desires to purchase curbing, cement and sewer pipe.

Newburgh, N. Y.—Special.—Arthur J. Wills, of the Broderick & Wind Engrg. & Const. Co., 67 Ann St., is in the market for all kinds of building materials.

Hopkinsville, Ky.—Special.—James L.

Long advises us that he is interested as a possible purchaser of hollow blocks.

Whiting, Ind.—Special.—Chas. Noef, box 438, desires to purchase cement.

Sault Ste. Marie, Mich.—Special.—C. H. McIlharger, cy. engr., advises us that he desires to purchase paving materials.

Wilkinsburg, Pa.—Special.—F. M. Duke, 202 Center St., desires to purchase cement, lime and sand.

Brookline, Mass.—Special.—Henry A. Varney, 100 Davis Ave., is in the market for paving materials.

Stratford, Ont.—Special.—Wm. Ireland, box 298, desires to purchase cement and building materials.

Medford, Mass.—Special.—Dana E. Peekins, 43 Maple Ave., desires to purchase iron and cement.

Spartanburg, S. C.—Special.—Ladshaw & Ladshaw are interested as possible purchasers in concrete for pavements and sidewalks.

Renfrew, Ont.—Special.—J. R. Stewart, box 105, is in the market for cement.

Corry, Pa.—Special.—Nevin D. Dickson, cy. engr., advises us that he desires to purchase water and sewer pipe, etc.

Tower City, Pa.—Special.—W. J. Heney desires to purchase cement and building material.

Milwaukee, Wis. — Special.—Gerhardt F. Steuwe, 308 20th St., is in the market for lime and cements.

Fergus Falls, Minn.—Special.—M. S. Hall is in the market for cement.

Tyrone, Pa.—Special.—Lannes Bros., 1436 Logan Ave., desire to purchase cement.

Ft. Atkinson, Wis.—Special.—Albert A. Voigt is in the market for cement blocks, cement brick and cement work of all kinds.

Frankfort, Ky.—Special.—C. Power desires to purchase cement.

Chicago, Ill.—Special. — George J. Byrnes, 434 Elm St., is in the market for cement, sand, crushed stone, etc.

Derby Line, Vt.—Special.—N. A. Beach desires to purchase lumber, lime, cement, hardware, paint, etc.

Rhinebeck, N. Y.—Special.—August Van Keuren advises that he desires to purchase coloring for blocks and concrete.

Lockland, O.—Special.—Wm. Griffin, 303 Mill St., is in the market for stone, gravel and cinders.

LIGHT, HEAT AND POWER.

New York City—The Crestmoor Mfg. & Supply Co. has been incorporated to manufacture mechanical and electrical appliances, by Robert L. Woolley, 320 Broadway; Harry J. Robinson, 146 W. 12th St., and others.

Buffalo, N. Y.—The American Oxy Gas Generating Co. has been incorporated to manufacture the Weber patents, a dry gas capable of perfect combustion. The incorporators are N. P. Hickey, of Bowling Green, O.; E. E. Wigle, of Leamington, Ont.; Peter Murray, W. H. Baker and C. L. Myer, of Buffalo.

MISCELLANEOUS.

New York City—The Monolith Re-Inforced Concrete Co. has been incorporated to repair structures, decorate, etc., by Wm. A. Moller, 26 Patchem Ave.; Edwin V. Farley, 329 Macon St.; Albert C. Spooner, 461 State St., Brooklyn.

Chattanooga, Tenn.—The Bridgeport branch of the United States Cast Iron Pipe & Foundry Co. will be moved to this city by September, according to press reports.

Camden, N. J.—The France Unit Concrete Steel Co. has been incorporated by Albert C. Middleton, I. C. Clow and John A. MacPeak.

Gainesville, Fla.—City council has decided to purchase a 10-ton combination roller and harrower, one No. 4 Champion crusher and one 20-horse-power electric motor, of the O. S. Kelly Co., of Springfield, O.

Patents of Interest to Municipalities and Contractors.

763,154. June 21, 1904. Grading Machine. Thos. C. Caswell, Potomac, Mont.

763,354. June 28, 1904. Apparatus for Removing Material from the Surface of Filter Beds. Hiram W. Blaisdell, Los Angeles, Cal.

763,410. June 28, 1904. Water Heater and Garbage Crematory. Albert Long, Chicago, Ill.

763,562. June 28, 1904. Cremating Furnace. Wm. Horsfall, Leeds, Eng.

765,518. July 19, 1904. Street Cleaner. John J. Smith, Joliet, Ill.

765,975. July 26, 1904. Apparatus for the Preparation of Tar Macadam. Edgar P. Hooley, Nottingham, Eng.

766,848. Aug. 9, 1904. Crematory. Fred P. Smith, New York, N. Y.

767,111. Aug. 9, 1904. Sewer Center. Wm. D. Kelley, Yonkers, N. Y.

767,170. Aug. 9, 1904. Engineer's Slide Rule. Leon W. Rosenthal, New York, N. Y.

768,194. Aug. 23, 1904. Catch Basin. Thos. D. Pierce, Cleveland, O.

768,579. Aug. 30, 1904. Tilting Garbage Receptacle. John D. Bragunier, Washington, D. C.

768,698. Aug. 30, 1904. Pavement. August E. Schutte, Belmont, Mass.

768,699. Aug. 30, 1904. Process of Laying Pavements. August E. Schutte, Cambridge, Mass.

768,867. Aug. 30, 1904. Apparatus for Cleaning Sewer Pipes. William H. Stewart, Malden, Mass.

769,123. Aug. 30, 1904. Asphalt Paving Cement. Frederick J. Warren, Newton, Mass.

769,156. Sept. 6, 1904. Machine for Cleansing and Separating Road-Making Material. John J. Everson, Newton, Mass.

769,189. Sept. 6, 1904. Device for Removing Snow and Ice from Pavements. Geo. Sibbald, New York, N. Y.

770,490. Sept. 20, 1904. Process of Purifying Sewage. John W. Alvord, Chicago, Ill.

771,952, 771,953, 771,954. Oct. 11, 1904. Street Pavements or Roadways. Fred'k J. Warren, Newton, Mass.

772,681. Oct. 18, 1904. Incinerating Furnace. Fred'k L. Stearns, New York, N. Y.

772,710. Oct. 18, 1904. Sewer Lift. Geo. V. Ellis, New York, N. Y.

772,924. Oct. 25, 1904. Street Cleaning Machine. Augustus A. Clough, Denver, Col.

773,029 and 773,030. Oct. 25, 1904. Process and Machine for Hydrating Lime. James Reaney, Jr., Sherwood, Md.

773,092. Oct. 25, 1904. Wheeled Scraper. Thos. R. McKnight, Aurora, Ill.

773,093. Oct. 25, 1904. Dump Wagon. Thos. R. McKnight, Aurora, Ill.

773,248. Oct. 25, 1904. Garbage Crematory and Water Heater. Morgan J. Cragin, Chicago, Ill.

773,834. Nov. 1, 1904. Apparatus for Slaking Lime. Bruce C. White, Pittsburg, Pa.

773,920. Nov. 1, 1904. Garbage Crematory. Benj. Boulger, New York City.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Flint, Mich.—A resolution was adopted at a meeting of the council, July 11, giving the protestants the privilege of taking up South Saginaw St. pavement at the alleged defective places, providing they file a bond in the sum of $1,000 to restore the disturbed places to as good condition as they find them. The pavement was laid two years ago, at an approximate cost of $35,000.

Canton, Ohio—An explosion occurred in the paved street on N. Cleveland Ave., near Chance Ave., July 17, in which the bricks, for a space of 60 or 70 sq. ft., were badly torn up. The explosion, which was accompanied by a loud report, was the second in that vicinity in a period of three weeks. The bricks have not been allowed sufficient space for expansion, and the intense heat caused the expansion to be greater than the compression of the cement filler, resulting in the explosion.

CONTEMPLATED WORK.

Boone, Ia.—Paving is contemplated for 7th st.

Jacksonville, Fla.—Brick paving is contemplated for Findley st.

Macon, Ga.—This city will issue $225,000 for street paving soon.

Rochester, Minn.—Paving is proposed for Main, College and 3d sts.

Pullman, Wash.—Council has decided to macadamize the principal streets.

Bartlesville, Texas—The property owners have petitioned for street paving.

Red Bank, N. J.—Rumson drive will be paved its entire length next year.

Newburgh, N. Y.—Mayor Wilson has signed a bill, appropriating $27,000 for paving Lander st.

Bellevue, Pa.—Orchard, Vine and Howard sts., Hawley ave. and Hallett Place are to be paved.

Ames, Ia.—The construction of permanent sidewalks on several streets has been authorized.

Knoxville, Ia.—The construction of permanent sidewalks on several streets has been ordered.

Kansas City, Mo.—An ordinance was passed July 17 for paving 39th st., from Main to Penn, with asphalt.

Payne, Ohio—A resolution has been passed to pave Main st. with vitrified brick. F. E. Stamper, vil. clk.

Marion, Ohio—Bids will be asked during the summer for paving sundry streets with brick. Geo. Dwyer, cy. engr.

Hartford, Conn.—The construction of a road from Farmington to West Hartford is contemplated, at a cost of $27,000.

Waterloo, Ia.—Asphalt paving with cement curb is contemplated for Wellington st. from 2d to 3d. R. C. Thompson, clk.

Lima, Ohio—Plans have been prepared and bids will be asked soon for paving S. Main st. with brick. R. H. Gamble, cy. engr.

Knoxville, Tenn.—Ordinances were passed July 19 for paving 4 districts with bituminous macadam, bitulithic, or asphalt.

Petersburg, Va.—The macadamizing of nearly every unpaved street in this city is recommended by the public improvement committee.

Janesville, Wis.—Plans are being prepared and bids will be asked for constructing 3 blocks of macadam road. C. V. Kerch, cy. engr.

Chicago, Ill.—The bd. of local impvts. decided, July 19, to pave a number of streets with asphalt, granite, macadam, brick and slag.

Atchison, Kans.—Council has passed an ordinance for brick paving on Kansas ave. and Spring st., with cement curb. Fred Giddings, cy .clk.

Madison, Wis.—J. F. Icke, cy. engr., has prepared plans for 8 blocks of asphalt paving around the State Capitol. Bids will be asked soon.

East St. Louis, Ill.—Plans are being prepared for paving 15th, 10th and 9th sts. with brick on 5-in. concrete base. W. J. Crocker, cy. engr.

Newark, N. J.—Morris R. Sherrerd, cy. engr., is devising plans which provide for this city purchasing its own brick to be used in paving the streets.

Wheeling, W. Va.—Council has ordered the employment of an engineer to prepare plans and specifications for paving Main, South and Market sts. with brick.

Lansing, Mich.—Plans and specifications have been adopted for 12,144 sq. yds. of paving on Capitol ave. and Grand, Walnut and Washtenaw sts. H. A. Collar, cy. engr.

Oshkosh, Wis.—Bids will soon be asked for constructing 3 blocks of brick paving with limestone curb and gutter, on Pearl and Division sts. W. A. Marden, chmn. B. P. W.

Canton, Ohio—Bids will be asked this fall for 12,690 sq. yds. of brick paving on Walnut st. Brick paving is also contemplated for Mahoning, E. 3d and E. 4th sts. F. E. Myers, cy. engr.

Mankato, Minn.—The city engineer has been directed to prepare plans and specifications for paving Main st. with creosoted blocks, from Broadway to Mark, and Center st. with brick, from 4th to Mark, and Mark st. with blocks, from Center to Main.

Maplewood, N. J.—Ordinances will probably be passed at a meeting to be held Aug. 1 for laying cement sidewalks in Baker st. and Maplewod ave.

Logansport, Ind.—The property owners on 5th st., between Broadway and North sts., asked for brick paving.

CONTRACTS TO BE LET.

Corydon, Ind.—Bids are asked until Aug. 8 for building 9 mls. of gravel road. Co. comrs.

Elizabeth, N. J.—Bids are asked until Aug. 1 for asphalt and block paving. W. H. Luster, Jr., cy. clk.

Johnstown, N. Y.—Bids are asked until Aug. 21 for 4 blocks of asphalt paving. J. F. Campbell, cy. engr.

Greensburg, Pa.—Bids are asked until

Aug. 7 for grading, curbing and paving Joe st. with vitrified brick.

Oak Park, Ill.—Bids are asked until Aug. 1 for paving Cuyler ave. with granite and macadam. Bd. local impvts.

Vincennes, Ind.—Bids are asked until Aug. 8 for constructing 6,555 ft. of gravel roads. J. T. Scott, co. audt.

English, Ind.—Bids are asked until Aug. 7 for grading and macadamizing several roads. Samuel E. McFall, co. audt.

Greensburg, Ind.—Bids are asked until Aug. 7 for constructing 11,500 ft. of macadam road. Frank E. Ryan, co. oudt.

Valley Forge, Pa.—Bids are asked until Aug. 1 for building stone roads here. A. H. Howren, sec'y Valley Forge Park Comn.

Auburn, N. Y.—Bids are asked until Aug. 8 for 13,400 sq. yds. of asphalt, bitulithic or brick paving. J. W. Ackerman, cy. engr.

Crownpoint, Ind.—Bids are asked until Aug. 15 for constructing 3 mis. of gravel road in Center twp. Samuel A. Love, chmn. bd. comrs.

Bayonne, N. J.—Sealed bids are asked until 8 p. m. Aug. 1 for 5,500 sq. yds. of asphalt paving on W. 26th st. W. C. Hamilton, cy. clk.

Logansport, Ind.—Sealed bids are asked until Aug. 8 for improving the Overmeyer road, in Jackson twp. Henderson Fickle, chmn. co. comrs.

Green Bay, Wis.—Bids are asked until Aug. 7 for grading, macadamizing and curbing Webster ave. and Porlier st. Com. on sts. and bridges.

Washington, D. C.—Sealed bids are asked until Aug. 5 for furnishing 4,000,000 paving brick. Genl. purchasing agt. Isthmian Canal Com'n.

Paulding, Ohio—Sealed bids are asked until Aug. 8 for grading, curbing, draining, macadamizing and paving William st. E. A. Roam, vil. clk.

Knox, Ind.—Sealed bids are asked until Aug. 8 for macadamizing and paving with gravel a number of highways. Sherman Carnes, chmn. co. comrs.

Keywest, Fla.—Bids are asked until Aug. 26 for filling and grading at the naval station. M. T. Endicott, ch. bureau yds. and docks, Washington, D. C.

Manchester, Ia.—Bids are asked until Aug. 8 for paving Franklin and Main sts. with vitrified brick or block with cement curbing. C. J. Seeds, cy. clk.

Cincinnati, Ohio—Bids are asked until Aug. 11 for improving Riddle road, Springfield twp., and repairing Deerfield road, Columbia twp. . L. Lewis, co. audt.

Shreveport, La.—Sealed bids are asked until Aug. 8 for paving 15 streets with asphalt, brick, bitulithic or pavement similar to bitulithic. C. G. Rives, compt.

Martinsville, Ind.—Bids are asked until Aug. 7 for building 14 1-2 mis. of gravel road in Clay twp. and 4 mis. in Ashland twp. Earle O. Gilbert, co. audt.

Springfield, Mass.—Sealed bids are asked until Aug. 3 for constructing 12,000 sq. yds. of bitulithic or bituminous macadam pavement. Arthur A. Adams, supt. sts.

Washington, D. C.—Sealed bids are asked until Aug. 4 for constructing macadam roadways on the approaches to a highway bridge across Potomac river. S. S. Leach, Lt.-Col. Engrs.

Buffalo, N. Y.—Bids are asked until Aug. 1 for paving with stone, crosswalk stone, curbing, sand and crushed stone for street repairs for the fiscal year 1905 and 1906. Francis G. Ward, dir. pub. wks.

Perth Amboy, N. J.—Sealed bids are asked until Aug. 7 for paving State st., from the L. V. R. R. bridges to Meredith property, with vitrified brick on a 6-in. foundation, and for grading Elm st. Wm. H. Fullerton, st. comr.

CONTRACTS AWARDED.

Newark, Ohio—The contract for paving W. Locust st., from 5th to 12th, was awarded to W. S. Pace.

Dayton, Ohio—The contract for repaving 5th st. with vitrified block was awarded to M. O. Herron & Co.

Clarinda, Ia.—Dunnegan & Corey, of Shenandoah, secured the contract for

La Crosse, Wis.—The La Crosse Stone Co. was awarded the contract, July 18, for paving an alley with brick.

Argenta, Ark.—The contract for macadamizing W. 4th st. was awarded to Woodsmall Bros., July 14, for $6,923.75.

Linton, Ind.—The contract for constructing 4 mis. of street paving was awarded, July 3, to Edward Pennington, of Vincennes.

Paducah, Ky.—Special.—A contract for 40,000 sq. yds. of bitulithic paving has been awarded to the Southern Bitulithic Company.

Charlotte, Mich.—George H. Kneal, of Lansing, secured the contract for paving Cochran ave. with Metropolitan block, for $34,547.

Superior, Wis.—The contract for paving 18th st., from Oakes to Hammond, was awarded, July 10, to Peterson & Holm, for $6,300.

Batavia, N. Y.—The contract for paving Main and Jackson sts. with brick was awarded to John Mahoney, of Jamestown, for $31,472.90.

Des Moines, Ia.—The Barber Asphalt Paving Co. was awarded the contract, July 7, for paving Walnut st. with asphalt, at $1.66 a sq. yd.

Ashland, Ohio—The contract for 9,600 sq. yds. of brick paving on Cleveland ave. was awarded to Phillips & Arnold, of this city, for $13,235.

Boise City, Idaho—The contract for constructing the Warren-Big creek wagon road was awarded to Whiteway & Hicks, of Weiser, for $25,000.

Marysville, Ohio—The contract for paving 3d st. with brick was awarded, July 6, to Jardine, Brewer & Tomlinson, of Chillicothe, at $1.21 a sq. yd.

Collegeville, Minn.—The contract for constructing tile walks at St. John's University was awarded to Gruber & Co., of St. Cloud, Minn., for $400.

Taunton, Mass.—Special.—The city council has awarded to Warren Bros. Co., of Boston, Mass., a contract for 12,000 sq. yds. of bitulithic paving.

Harrison, N. J.—The contract for paving Worthington ave. with bitulithic was awarded, July 11, to Van Kuren & Son, of this place, for $17,010.58.

Meridian, Miss.—The contract for vitrified brick paving was awarded to the Southern Paving and Construction Co., of Chattanooga, Tenn., for $46,859.

Allentown, Pa.—The contract for 32,791 sq. yds. of asphalt paving on Liberty, Jefferson and Madison sts. was awarded to the Barber Asphalt Paving Co.

Wichita, Kans.—The Cleveland Trinidad Asphalt Co. was awarded the contract, July 17, for resurfacing portions of Main st. and Douglas ave. with asphalt.

Noblesville, Ind.—The contract for constructing Cline gravel road in Adams twp. was awarded to Boyer, Wellman, Wood & Pickard, of Frankfort, for $5,995.

Belleville, Ill.—Reeb Bros. secured the contract for paving N. Illinois st. with Albion block, at $1.52 a sq. yd., and 50 cts. a lineal ft. for sandstone curbing.

Moline, Ill.—The McCarthy Construction Co. of Davenport, Ia., secured the contracts for Warren Bros. bitulithic on 9th ave. and 7th st., July 5, for $18,834.

Williamsport, Pa.—The contract for paving E. 4th st., from Mulberry to Penn sts., with brick with concrete curb and gutters, was awarded, July 10, to Busch & Stewart.

Milwaukee, Wis.—The Badger Construction Co. was awarded the contract, July 17, for paving Galena st., from 3d to 4th, with Kettle river sandstone, at $2.82 a sq. yd.

Sioux City, Ia.—The contract for 3,700 sq. yds. of asphalt paving on Jones and 5th sts. with awarded to the Barber Asphalt Paving Co., of Des Moines, at $2.03 a sq. yd.

Kewanee, Ill.—The contract for constructing about 100,000 sq. ft. of cement and brick walks was awarded to Reiff & Kleinemeir, of this city, at 14 and 13 cts. a sq. ft. respectively.

St. Joseph, Mo.—The contract for macadamizing 19th st., from Messanie to Charles, was awarded, July 19, to Rackliffe, at $1.10 a sq. yd., and for 18th st., to Fred Roth, at $1.20 a sq. yd.

Bozeman, Mont.—Special.—The Two Miracles Concrete Co., of Minneapolis, Minn., was awarded contracts, July 12, for sidewalks, paving, gutter, street crossings, etc., at a cost of $32,000.

Birmingham, Ala. — Special. — The Southern Bitulithic Company has been awarded contracts aggregating 98,457 sq. yds. of bitulithic paving on 20th, 19th and S. 20th sts., and 5th and Highland aves.

Rochester, N. Y.—Whitmore, Rauber & Vicinus secured the contract, July 11, for paving Park ave., from Meigs st. to Barrington, with asphalt, with Johnsonburg brick between the car tracks, for $37,-838.

Grand Rapids, Mich.—The contract for paving W. Bridge st. was awarded, July 14, to John Hlaeschutter, for $18,500, with $4.55 extra per cu. yd. for concrete, and 35 cts. extra per cu. yd. for excavation.

Indianapolis, Ind.—The Hoosier Construction Co. has been awarded the contract for paving Northwestern ave. with Warren Bros. bitulithic, after much contest and some litigation, at $3.11 per front foot of each side of the street.

Evansville, Ind.—The Barber Asphalt Paving Co. was awarded the contract for paving Riverside ave., Walnut and 6th sts. with asphalt, and the Wadsworth Stone and Paving Co. secured the contract for paving Linden and Chandler sts. with asphalt.

Logansport, Ind.—The contract for paving North st., from 3d to 12th, with Warren Bros. bitulithic was awarded, July 8, to the Western Construction Co., at $1.60 a sq. yd., inclusive of excavation, etc.; cement curb and gutter, 60 cts. a lin. ft. and 50 cts. a lin. ft. for cement curbs at alley intersections.

Long Island City, L. I.—Contracts for constructing 5 highways have been awarded as follows: Asphalt paving and flagged sidewalks on Carver st., Interstate Paving Co., $8,280, who also received the contract for the same work on 9th ave., for $7,770; grading, curbing and laying sidewalks on Radde st., Bart Runn, $6,430; Crescent st., Unique Const. Co., $5,185.

Fort Wayne, Ind.—The contract for paving Broadway st. with asphalt was awarded, July 3, to the Barber Asphalt Paving Co. The Menefee Artificial Stone Co. was awarded the contract for constructing cement sidewalks on Jackson, Rockhill and Berry sts., Derheimer & Co., the contract for brick sidewalks on Fletcher ave. and Simon st., and George Wilhelm the contract for brick sidewalks on Walton ave.

New York City—Contracts for constructing over $600,000 worth of asphalt and wood pavements were awarded, July 18. The Asphalt Const. Co. got more than 75 per cent. of the asphalt contracts, at an aggregate cost of $350,000. This company bid about 90 cts. a sq. yd. The remainder of the asphalt contracts were divided among the Sicilian, the Barber and the Uvalde companies, whose bids were less than $1 a sq. yd. The contracts for wood block pavements were divided between the U. S. Preserving Co., the Franklin Contracting Co., and Eppinger & Russell, whose bids ranged from $2.50 to $2.90 a sq. yd. The contracts carry with them a 10-yrs. maintenance clause, however. It also provides that where the contractors remove the old Belgian block pavements they shall pay the city $10.50 per 1,000 blocks.

Detroit, Mich.—Paving contracts were awarded, July 10, as follows: Barber Asphalt Paving Co., Warren ave., from 2d to Avery aves., including resurfacing track with brick, $20,092.55; Baker st., from 24th to Vinewood ave., $7,768.49; 14th ave., Michigan ave. to Bagg st., including resurfacing track with brick, $10,-613.78; 4th ave., Kirby to Holden aves., $11,558.23; paving 26th st., from Hancock to McGraw aves., W. W. Hatch & Sons, $14,446.52; repaving Catherine st., Hastings to Russell sts., Lennane Bros., $5,345.74; repaving Catherine st., from Dequindre st. to St. Aubin ave., including resurfacing track, Michigan Contracting Co., $2,529.37; repaving Hastings st., from Brady st. to Canfield ave., including resurfacing of tracks, Julius Porath, $8,722.37; repaving Mack ave., from Gratiot to Mt. Elliott aves., less double track, W. W. Hatch & Sons, $8,401.51.

St. Louis, Mo.—The lowest bidders, July 19, for the repair of asphalt streets were as follows: Herman Construction Co., Cottage ave., two sections, $23,220.90 and $7,625.25. Fruin & Colnon, Palm st., $32,991.08; Laflin st., $8,948.35; Talcott ave., $10,815.58. Rucking Const. Co., Texas ave., two sections, $6,935.05 and $9,590.91; Sidney st., $43,160.99. Granite Bituminous Paving Co., Clark ave., $12,-031.

Ft. Wayne, Ind.—The contract for paving Fulton st., from Pearl to Brackenridge, divided into two sections, was awarded to the Cleveland Trinidad Asphalt Co.

Pittsburg, Pa.—The contract for improving three roads was awarded to W. W. Kelly, and for two roads to W. E. Hawley, July 18.

SEWERS.

Temple, Texas—The Temple Sanitary Sewer Co. has been incorporated by P. L. Doures, F. L. Denison and L. S. Williamson.

CONTEMPLATED WORK.

Rhinelander, Wis.—A sewer in the 5th ward is proposed.

St. Charles, Mo.—Plans are being prepared for sewers.

New Hampton, Ia.—A sewer on Maple ave. is proposed.

Fernie, B. C.—Bids will be asked soon for building sewers.

Sabetha, Kans.—Plans are being prepared for sewers.

Cairo, Ill.—About 8,900 ft. of trunk sewers is contemplated.

Belle Fourche, S. D.—The plans for a sewerage system are almost completed.

Eveleth, Minn.—The question of constructing a sewerage system is being agitated.

McPherson, Kans.—A new sewerage system is contemplated. W. J. Krehbiel, mayor.

Shawnee, Ok.—This city will vote on the issue of bonds for a sewerage system.

Wabash, Ind.—A 36-in. main sanitary sewer is contemplated. John Hilty, cy. engr.

Lorain, Ohio—An ordinance has been passed for building a lateral sewer in Payne ave.

Centerville, Ia.—The construction of new sewers is contemplated. M. G. Hall, cy. engr.

New Ulm, Minn.—This city voted to issue $30,000 bonds for constructing a sewer system.

Greenville, Mich.—Plans are being prepared for a separate system of pipe sewers.

Paulding, Ohio—A resolution has been Zimmermann, $15,391.86; Holton and iron sewers in 2d and Center sts., G. E. passed to construct a sewer in Williams st. Wm. Moorehead, mayor.

Tell City, Ind.—Contracts will be let soon for a main sewer on Washington st. Frank Hinkle, cy. clk.

Dallas, Tex.—This city will vote Aug. 2? on the issue of bonds for diverting sewage from Trinity river.

Kearney, N. J.—An ordinance has been passed for building a sewer in Maple st., from Woodland to Pomeroy aves.

Bartlesville, I. T.—This town will vote Aug. 8 on the issue of $17,000 for extending the sewerage system.

Mooresville, Ind.—The town board has adopted a resolution providing for the construction of a sewerage system.

Ravenna, Ohio—An ordinance was passed July 15, providing for the issue of $65,000 bonds for constructing additional sewers.

West New York, N. J.—Town council has decided to construct a sewer in 20th st., from Madison st. to Bergenline ave.

Kenton, Ohio—Plans are being prepared and bids will be asked soon for constructing several sewers. P. K. Strong, cy. engr.

South Bethlehem, Pa.—This city will vote Aug. 1 on the issue of an additional $25,000 to build storm and house sewers.

Osawatomie, Kans.—Plans for sewers have been completed, but the date for receiving bids has not yet been decided upon.

Muskegon, Mich.—About 12 mis. of the Spring st. sewerage system will be built this year. Clifford S. Gamble, cy. engr.

Seattle, Wash.—The Green Lake Improvement Club has petitioned for a sewer system, to be installed in the Green Lake District.

Reading, Pa.—Ordinances have been passed for building house drain sewers in various districts. Elmer H. Beard, cy. engr.

Danville, Ill.—A brick storm sewer, with pipe laterals, is contemplated for North st. to Stony Creek. W. H. Martin, cy. engr.

Watertown, N. Y.—Henry Baker, cy. engr., has been directed to prepare plans and specifications for constructing several sewers.

Monroe, Mich.—The question of constructing sewers, at a cost of $60,000 to $70,000, will be voted on. Harry J. Sterner, cy. clk.

Spencer, N. C.—This city voted to issue $75,000 bonds for public improvements, including streets, water works, electric light plant and schools.

Angola, Ind.—This city will expend $90,000 in the construction of three trunk line sewers this year. The branches will be built next year.

Akron, Ohio—Bids will be asked soon for constructing a sanitary sewer from the Boulevard to Wolf st., through Lakeside Park. J. W. Payne, cy. engr.

Kansas City, Mo.—The city engineer has been directed to prepare plans and procure bids for a storm sewer to care for the water south from 8th st. and north from 27th st.

Hartford, Conn.—The question of constructing an intercepting sewer along Connecticut river, for the disposal of the sewage of the entire city, is being discussed. F. J. Ford, cy. engr.

Wilmington, N. C.—The Brooklyn Sewerage Co. has been granted a charter to construct a sewerage system. The incorporators of the company are J. H. Rehder, H. L. Fentress, G. H. Heyer and Jesse Wilder.

Chagrin Falls, Ohio—Council has passed an ordinance providing $325 for a preliminary survey for a sanitary sewerage system and authorized a committee of three councilmen to employ an engineer for that purpose.

St. Paul, Minn.—A system of sewers is contemplated in Fairview and other streets at a cost of about $26,000.

Flushing, L. I.—The construction of sewer systems is contemplated in Ingleside Bowne Park.

Maplewood, N. J.—Geo. E. Low has been appointed engr. in ch. of the proposed sewer in the Ridgewood road section.

CONTRACTS TO BE LET.

Batavia, Ill.—Bids are asked until Aug. 1 for installing a sewerage system. Geo. S. Burnett, cy. clk.

Norwood, Ohio—Bids are asked until Aug. 12 for a sanitary sewer in Main Dist. No. 3. E. R. Edwards, clk. B. P. S.

Columbus, Ohio—Bids are asked until Aug. 4 for constructing Rennick Run sewer and Jackson Pike sewer. Clk. B. P. S.

Rensselaer, Ind.—Bids are asked until Aug. 4 for constructing the Iroquois ditch. Jas. M. Leatherman, co. audt.

Windom, Minn.—Bids are asked until Aug. 1 for constructing sewers in several streets. J. E. Jennings, vil. recorder.

Massillon, Ohio—Bids are asked until Aug. 3 for constructing sewers in numerous streets. Harold Howard, cy. engr.

Valparaiso, Ind.—Bids are asked until Aug. 1 for constructing the Hutton ditch, 14 mis. long. Frank B. Parks, const. comr.

Cincinnati, Ohio—Bids are asked until Aug. 14 for constructing sewers and drains in Kinney ave. Geo. F. Holmes, clk. B. P. S.

West Point, N. Y.—Sealed bids are asked until Aug. 8 for constructing a storm sewer, surface drainage and sewer system. Q. M.

Lake Placid, N. Y.—Bids are asked until Aug. 1 for constructing a trunk sewer, 4 mis. long. F. A. Isham, counsel bd. sewer comrs.

Cincinnati, Ohio—Bids are asked until Aug. 11 for constructing sewers and drains in East Miami road, Miami twp. E. L. Lewis, co. audt.

Winchester, Ind.—Sealed bids are asked until Aug. 16 for constructing 6,400 ft. of sewer, ranging in depth from 12 to 21 ft. C. C. Yunker, cy. engr.

Marinette, Wis.—Sealed bids are asked until 2 p. m. Aug. 1 for building a sewer on Daggett st., from Church to 11th st. Jacob Wittig, chmn. B. P. W.

Perry, Ia.—Bids are asked until 7:30 p. m. Aug. 2 for constructing 8 1-3 mis. of sewer, 1 mi. outfall sewer, and a sewage disposal plant. Adrian Cross, cy. clk.

Wyandotte, Mich.—Sealed bids are asked until 6 p. m. Aug. 2 for installing a complete system of brick, vitrified and cement pipe sewers. H. A. Maloch, sec'y B. P. W.

Grand Rapids, Mich.—Sealed bids are asked until Aug. 11 for constructing a concrete steel, concrete or brick sewer along West Side ditch. L. W. Anderson, cy. engr.

Marion, Ind.—Bids are asked until 2 p. m. for constructing the middle fork of the Wildcat ditch and branches in Liberty and Green twps. Cortez Knight, drainage comr.

Clinton, Ia.—Sealed bids are asked until Aug. 24 for constructing about 4 mis. of brick and concrete sewers. Chas. P. Chase, of Iowa Engrg. Co., Engr.; M. E. Jordan, cy. clk.

Pipestone, Minn.—Sealed bids are asked until 8 p. m. Aug. 2 for constructing certain sewers and appurtenances, and 2 reinforced concrete septic tanks. S. W. Funk, cy. recorder.

West Haverstraw, N. Y.—Bids are asked until Aug. 5 for sewers and connections for State Hospital for Crippled and Deformed Children. Rt. Rev. H. C. Potter, Prest. Bd. Mgrs.

Washington, D. C.—Sealed bids are asked until Aug. 21 for furnishing one 15-ton electric traveling crane for the sewage pumping station, sewage disposal system. H. B. F. MacFarland, chmn. Dist. Comrs.

Chicago, Ill.—Sealed bids are asked until Aug. 23 for constructing 15 mis. of concrete sewers ranging in diameter from 10 1-2 to 3 ft.; also, for the construction of a pumping station building and the erection of 3 centrifugal pumping engines. Andrew M. Lynch, prest. bd. local impvts.

Grafton, N. D.—Sealed bids are asked until Aug. 5 for the extension of the sewer from the intersectioh of 5th and Kittson sts. to a point conecting with the sewer on 7th st. Bids will also be received at the same time for a reinforced concrete septic tank, pump house and machinery therefore. L. B. Baldwin, supt. bd. trustees, N. D. Institution for Feeble Minded.

Steubenville, Ohio—Sealed bids are asked until Aug. 21 for a sewer on Adam and Logan sts. T. W. Vance, clk. B. P. S.

CONTRACTS AWARDED.

Meridian, Miss.—The contract for constructing sewers was awarded to D. D. Broggs, for $4,980.

Tuscumbia, Ala.—Crow & Angle, of Florence, Ala., secured the contract for a sewerage system here.

Gettysburg, Pa.—The contract for constructing a sewerage system was awarded to Fehr & O'Rourke, of Reading.

London, Ohio—The contract for constructing a sewage disposal plant was awarded to Joseph Murphy, for $52,000.

Columbus, Ohio—The contract for building a storm sewer on Eldon ave. was awarded to A. F. Helm, for $15,944.65.

Columbus, Ind.—Stillinger & Lee, of this city, secured the contract for building a sewer in 9th st., for $9,092.

Mishawaka, Ind.—The contract for constructing 1 mi. of sewer was awarded to the Northern Construction Co., for $4,000.

Binghamton, N. Y.—The contract for the 5th ward trunk sewer was awarded to M. J. Herrick & Co., of this city, for $16,279.

St. Louis, Mo.—The contract for furnishing 25 sewer inlets was awarded to the Buehler-Cooney Construction Co., for $3,626.20.

Rock Falls, Ill.—The contract for constructing a sewerage system was awarded to W. M. Dearborn, of Stone City, Ia., for $15,401.

Marshall, Minn.—The contract for 2,699 ft. of sewers was awarded, July 8, to Ilstrup & Olson, of Minneapolis, for $2,098.

West Allis, Wis.—The contract for constructing 1,040 ft. of storm sewer on Mitchell st. has been awarded to O. R. Tower, of this city, at $2.95 a ft.

Ithaca, N. Y.—The contract for constructing Hobart st. sewer was awarded to J. W. Johnston for $5,082, and on Whitesboro st., to John F. Auger, for $1,182.

Westfield, Mass.—The contract for building sections 10 and 11 of the storm water sewer was awarded to Dan A. Dorey & Co., of Somerville, Wass., for $6,500.

Chicago, Ill.—The contract for constructing the uncompleted portion of the Lawrence ave. intercepting sewer was awarded, July 13, to M. H. McGovern, for $653,331.

East Syracuse, N. Y.—The contract for completing the sewerage system from the receiving well to the disposal plant was awarded to C. T. Hookway, of Syracuse, for $16,000.

Marion, S. C.—The contract for constructing 7 mis. of tile pipe sewers, septic tanks and filter beds was awarded to Frederick Minshall, of Abbeville, S. C., for about $24,000.

Milwaukee, Wis.—Sewer contracts were awarded, July 12, as follows: Brick and Buffum sts., F. H. Nakielski, $3,401.74; 22d st., H. Hohensee, $1.65 a ft.; Chambers st., H. Hohensee, $2.03 a ft.; Rusk ave. and Ellen st., E. Bowler, $1.38 a ft.

Chicago, Ill.—The contract for constructing a sewer in Lawrence ave. was awarded to H. M. McGovern, at $9 a ft., or $650,000.

WATER WORKS.

Cincinnati, Ohio—The new water works system will not be completed and ready for operation until Jan. 1, 1907.

Bayonne, N. J.—The city government will reduce the water rates except in the case of manufacturers, the reduction to take effect in the quarterly bills to be issued Aug. 1. Meter measurement at $2 per thousand cubic feet will take the place of the old rates for householders and all others, except factories.

Columbus, Ohio—Judge T. M. Bigger, of the common pleas court, refused, July 5, to enjoin the board of public service from awarding the contract for the erection of the filtration plant to Westwater & Casey. The contract was attacked because of a misplaced decimal point, making the recapitulation dollars instead of cents.

CONTEMPLATED WORK.

Markle, Ind.—This town voted against a municipal water works system.

Sabetha, Kans.—Plans are being prepared for a water works and sewer system.

Mankato, Minn.—The extension of the water mains is contemplated. Mayor Taylor.

Salem, Mass.—The question of increasing the water supply is being investigated.

Savannah, Mo.—Plans and specifications for a water works system are being prepared.

Hope, Ind.—The town board is considering the matter of installing a water works system.

Charles City, Ia.—Council has decided to construct a reservoir of 300,000 gals. capacity.

Oswego, N. Y.—The taxpayers may vote on the issue of $200,000 bonds for a lake water supply.

Dickinson, N. D.—The question of issuing bonds for building water works will be voted on Aug. 9.

Norwood, Ohio—Bids are asked until Aug. 5 for extending the water mains. A. R. Edwards, clk. B. P. S.

Tupelo, Miss.—This town has voted an additional $25,000 to complete the water works and sewerage systems.

West Lebanon, Pa.—From $15,000 to $25,000 will be expended for a public water supply, according to press reports.

West Chester, Pa.—This city will expend about $10,000 for water works improvements. Benj. E. Heston, chmn. water com.

Wilmington, Del.—Plans are being prepared by cy. engr. Leisen for the new reservoir for the proposed new water system.

Columbus, Ind.—The matter of deep-driven wells is being investigated by the w. w. com. for a water supply for this city.

Findlay, Ohio—The city council voted, July 10, to appropriate $5,000 for the completion of the reservoir. W. W. trustees.

Gananoque, Ont.—This town voted, July 6, to issue $35,000 bonds for the completion of the water works and sewerage systems.

Chicago, Ill.—Bids will be asked soon for reconstructing the city water tunnels in the downtown districts. John Ericson, cy. engr.

Waukesha, Wis.—A resolution was passed, July 12, directing the bd. of pub. wks. to prepare plans and specifications for an adequate municipal plant.

Pueblo, Colo.—The citizens are agitating the question of securing water from the Greenhorn Range, about 30 mls. southwest of here. J. S. Greene, supt.

Allentown, Pa.—The finance com. of councils has decided to report favorably on the ordinance providing for the laying of a 12-in. main on Liberty st.

Victoria, B. C.—Arthur L. Adams recommends that a water supply be secured from Coldstream. He estimates the cost of a water works system at $600,000.

St. Johnsbury, Vt.—The village trustees recommend that a water supply be taken from Halls Pond, and that water works plant be installed. Chas. A. Stanley, chmn.

Pasadena, Cal. — The Progressive League of South Pasadena has asked the city trustees to call a bond election for the purpose of establishing a water system.

Struthers, Ohio—The Mahoning Valley Water Company, of Youngstown, was incorporated July 17 to secure a water supply for this city and secure franchises for laying water mains.

The question of constructing water works systems is being considered by cities and towns as follows: Pleasant Grove, Utah; Bassett, Neb.; Enderlin, N. D.; Arlington, Neb.; Leesburg, Ohio.

Provo, Utah—This town voted, July 11, to issue $91,000 municipal bonds for the completion of the water works system extension and a municipal lighting plant.

The question of issuing bonds for the construction of water works has been favorably voted on, at the following places: Corvallis, Ore.; Dover, Pa.; Breaux Bridge, La.; Franklin, N. H.

Fergus Falls, Minn.—John Adamson has submitted estimates of the cost of the proposed municipal water works system, which are as follows: Laying mains and incidentals, $67,000; pumping station, $16,500; total, $83,500.

Ft. Williams, Ont.—Plans for a water works system have been prepared by John Galt, of Toronto. He estimates the cost of the system, including a tunnel, a supply main, a compensating steel storage tank, 18-in. c. i. main and river crissing, at $215,000.

Newton, N. C.—This town is considering a proposition from the Interstate Water Works & Construction Co., in which they propose to install and operate a water works system for 10 years, at the end of which time the town may acquire the works if it so desires.

Atlanta, Ga.—The special committee appointed by council to investigate the needs of the water works system is about ready to make a report on the advisability of holding an election for issuing bonds for improving the system. Alderman E. C. Peters is chairman of the committee.

Troy, N. Y.—The water works supply com. has submitted a report to the mayor recommending the establishment and operation of a filtration plant. The commission consists of Prof. Wm. P. Mason, of this city; Samuel M. Gray, Providence, R. I.; George W. Fuller, New York city.

New Orleans, La.—The sewerage and water bd. authorized, July 13, the selection of three additional engineers to assist Supt. George C. Earl in the preparation of plans for a water purification plant. The construction of a 12-in. water main on the river front, from Louisiana ave. to Clouet st., is contemplated.

Muncie, Ind.—Local business men, headed by Homer H. Highlands, have made a proposition to the bd. of pub. wks. asking for permission to establish a water works plant, on condition that they be given the sole franchise in the city, and that the present concern, owned by the American Water Works Co., be refused a franchise on the expiration of its contract. The contract expires in a few months.

CONTRACTS TO BE LET.

Hammond, La.—Bids are asked until Aug. 8 for constructing a water works system. Jas. B. Adams, town clk.

Lonetree, Ia.—Bids are asked until Aug. 14 for constructing a water works system. R. L. Harris, cy. clk.

Saginaw, Mich.—Bids are asked until Aug. 3 for c. i. pipe and specials. Andrew J. Lynch, clk. B. P. W.

Newark, Ohio—Bids are asked until Aug. 12 for constructing a water works system. John P. Lamb, prest. B. P. S.

Homestead, Pa.—Bids are asked until Aug. 7 for furnishing 1,200 ft. of 6-in. c. i. water pipe. A. Hill, boro clk.

Grand Rapids, Minn.—Bids are asked until Aug. 14 for laying 1,504 ft. of 6-in. water pipe. G. C. McAllister, recorder.

Barnesville, Minn.—Bids are asked until 8 p. m. Aug. 5 for installing a water works system. M. J. Philippi, cy. clk.

Winnipeg, Man.—Sealed bids are asked until 3:30 p. m. Aug. 7 for furnishing gas engine pumping plant. C. J. Brown, cy. clk.

Cincinnati, Ohio—Bids are asked until

Aug. 11 for laying about 4,470 ft. of 20-in. c. i. pipe. Robt. V. Foster, clk. comrs. w. w.

Lyndhurst, N. J.—Bids are asked until Aug. 14 for laying c. i. pipe and appurtenances in Union twp. Wm. L. Grant, clk. Union twp.

Madison, S. D.—Bids are asked until Aug. 3 for furnishing and laying 2,000 ft. of 4 1-2-in. water mains and 4 hydrants. Wm. Rae, cy. audt.

Hot Springs, S. D.—Bids are asked until Aug. 5 for constructing a reservoir, powerhouse and other buildings at Battle Mountain Sanitarium, N. H. D. V. S.

Grand Rapids, Mich.—Sealed bids are asked until Aug. 11 for constructing a standpipe or elevated tank of concrete-steel or steel. L. W. Anderson, cy. engr.

Jacksonville, Fla.—Sealed bids are asked until 3 p. m. Aug. 4 for furnishing a motor generator set of about 300 k. w. capacity. B. F. Dillon, chmn. bd. trustees.

Ashland, Pa.—Sealed bids are asked until 8 p. m. Aug. 1 for 6,800 ft. of 6 to 10-in. c. i. pipe, 19 fire hydrants, 25 gate valves, 5 reducing valves, and specials. John X. Dence, sec'y coun.

Denver, Colo.—Bids are asked until Aug. 16 for constructing the Pathfinder dam and auxiliary works at a point about 50 mis. southwest of Casper, Wyo., to impound the flow of North Platte river.

Ft. Revere, Hull, Mass.—Bids are asked until Aug. 9 for making extensions and improvements to the post water supply and installing a Worthington steam pump. Major John E. Baxter, Q. M.

Mascoutah, Ill.—Bids are asked until Aug. 3 for constructing water works, consisting of steel storage tank and steel tower, 5,000 ft. 6 to 8-in. c. i. pipe, valves, specials, hydrants, etc. C. J. Lischer, cy. clk.

Ft. McPherson, Ga.—Bids are asked until Aug. 15 for constructing a reservoir, pump house and installing machinery for air lift system and making connections with deep wells and water system. Capt. B. B. Buck, const. Q. M.

Oneida, N. Y.—Sealed bids are asked until Aug. 8 for constructing water works improvements, consisting of a concrete dam, an earth dam, and an Ambursen concrete steel dam; construction of a pipe line connection between said dam and the pipe line now used by the city; grubbing, clearing and fencing land to be used for said reservoir. G. L. Scheifele, mayor.

Columbia, S. C.—Sealed bids are asked until Aug. 8 for constructing a water works system, the work embracing approximately 12 mis. of c. i. pipe, a standpipe, turbine water wheels, power pumps, centrifugal pumps, filtration plant, pumping engines, boilers, engines, power station, hydrants, gate valves and other appurtenances. J. W. Babcock, chmn. bd. water comrs.

Montrose, Colo.—Bids are asked until Aug. 28 for constructing 8 mis. of main distributing canal, including 525,000 cu. yds. of excavation, 20,000 cu. yds. concrete masonry for the conveyance and partial distribution of 1,300 cu. ft. of water per second from the mouth of the Gunnison tunnel, near Cedar Creek, to a point on the Uncompahgre river, 9 mis. south of Montrose.

Attleboro, Mass.—Propositions from purchasers for the standpipe now in use by this city will be received until Oct. 12 by the water commissioners. The standpipe is a wrought iron structure, 30 ft. in diameter and 125 ft. high, covered with a roof of structural steel and galvanized iron. Geo. H. Snell, supt.

CONTRACTS AWARDED.

Halstad, Minn.—C. H. Porritt, of Fargo, N. D., secured the contract for extending the water mains, for $1,290.

Ringsted, Ia.—The contract for installing a water works system was awarded to the National Construction Co., of South Bend, for $2,400.

Rochester, N. Y.—The contract for constructing the Cobbs Hill water reservoir will probably be awarded to Denis-ton & Co., of this city, for $390,805.

Augusta, Me.—Chas. E. Hoxie, of this city, was awarded the contract for constructing a pumping station at East Winthrop for the Augusta Water District, for $6,974.

Woonsocket, R. I.—The Builders' Iron Foundry, Providence, R. I., was awarded the contract for a new pumping engine for the pumping station of this city, for $15,770.

Spokane, Wash.—The contract for furnishing the steel riveted water mains for the new water works system was awarded, July 17, to the Union Iron Works, of this city, for $91,904.40.

Utica, N. Y.—The Utica Consolidated Water Co. awarded the contract for constructing a 24-in. pipe line to carry water from West Canada creek to Trenton Falls dam, to Joseph Dunfee, of Syracuse, N. Y., for $90,000.

Peabody, Mass.—C. E. Trumbull & Co., of Boston, was awarded the contract for laying 15,400 ft. of iron pipe for the additional water supply, for $23,680. The Warren Foundry & Machine Co., of New York city, was awarded the contract for furnishing the pipe.

Havre, Mont.—Special.—C. W. Swearingen, cy. engr., says the contract for constructing a water works system was awarded, July 18, to Fuller & Bossnot, for $42,412.82. The other bidders were: Lease & Richards, $44,488.24; J. H. Donlin, Great Falls, Mont., $45,981.76. The other bidders are of this city.

Cincinnati, Ohio—Special—This city has awarded to J. S. Jackson, who is connected with the California Asphaltum Sales Agency, a contract for the waterproofing work for its new reservoir. The contract aggregates over $268,000 and is one of the largest asphalt contracts ever given out. The work will be done with California material.

Boston, Mass.—Special.—Contracts have been awarded the Ambursen Hydraulic Construction Co. of this city, for building two dams in northeastern Pennsylvania. The dams will be 320 feet long by 21 feet high and 400 feet long by 13 feet high respectively. The development is a private enterprise, and by means of flumes and pen stocks the water will be worked off over a head of 950 feet, using Pelton wheels. This is one of the first high head propositions in the east.

BRIDGES.

Fargo, S. D.—Bids are asked until Aug. 8 for building 3 bridges. Arthur G. Lewis, co. audt.

Brownstown, Ind.—Bids are asked until Aug. 8 for constructing 13 bridges. H. W. Wacker, co. audt.

Mt. Clemens, Mich.—Bids are asked until Aug. 7 for constructing a concrete bridge. Wm. F. Kracht, cy. clrk.

Morristown, N. J.—Bids are asked until Aug. 1 for building a new bridge on Green Village road. Freeholder Weber.

Merced, Cal.—Bids are asked until

Aug. 8 for building bridges on the Merced and Dos Palos road. Bd. supvrs.

Clarksdale, Miss.—Bids are asked until Aug. 7 for constructing a steel bridge across Sunflower river. Bd. supvrs.

Virginia City, Mont.—Bids are asked until Sept. 8 for building 2 steel bridges over Big Hold river. Co. comrs.

Frankfort, Ind.—Bids are asked until Aug. 7 for constructing bridges and concrete culverts. David Allen, chmn. co. comrs.

Gardiner, Me.—This city will build a new steel draw-bridge across the Kennebec river between this city and Randolph, this fall.

Marion, Ohio—Bids are asked until Aug. 7 for building a new steel bridge over Scioto river. L. M. Hipsbar, co. audt.

Elmira, N. Y.—Bids are asked until Aug. 1 for the purchase of metal work of the present Lake st. bridge. Jervis Langdon, sec'y Lake St. Bridge Comrs.

Sacramento, Cal.—The bd. of supvrs. has directed the surveyor to prepare plans and specifications for a concrete bridge over Buffalo creek.

Bridgeport, Conn.—Bids are asked until Aug. 10 for constructing a reinforced concrete bridge over Ash creek, between this city and Fairfield. E. T. Buckingham, cy. clk.

Wheeling, W. Va.—The Bellaire, Benwood & Wheeling Bridge Co. has made application for a franchise for an approach to a bridge to cross the Ohio river at 2d st.

Springfield, Ohio—Cy. Engr. Sieverling has recommended to the bd. of pub. service that bids for concrete abutments for the new Water st. bridge be given preference if any are received.

North Tonawanda, N. Y.—Plans and specifications have been prepared by the New York Central for the reconstruction of the swing bridges leading to Goose Island, in Tonawanda, and Tonawanda Island, in North Tonawanda.

New York City—Bids will be opened Aug. 10 for all the steel work on the new Manhattan bridge, including the metal work for the anchorages, constructing the towers, cables, suspenders and suspended superstructures. Br. comr. Best.

Knoxville, Tenn.—The contract for constructing the W. Clinch ave. viaduct was awarded to the Wm. J. Oliver Co., of this city. Plans for the structure, which will be of concrete with steel reinforcement, were made by Edwin Thacher, of the Concrete Steel Engineering Co., of this city.

Decatur, Ind.—Bids are asked until Aug. 7 for building bridges and arches. Ed. co. comrs.

Tipton, Ind.—Bids are asked until Aug. 7 for constructing a concrete or steel bridge. T. W. Longfellow, co. audt.

Boston, Mass.—Special.—A. A. Low will build on his estate at Horse Shoe, N. Y., in the Adirondacks, a concrete steel dam across Bog river, including powerhouse and penstocks for generating power and transmitting same to his saw and planing mill, two miles distant on the railroad. The novel feature of the construction is that the dam will also serve as a railroad bridge to carry over his standard gauge logging road. For this purpose the buttresses project up through the body of the dam and carry the track at a clear elevation of five feet above the dam. The contract for all the above work, including about a mile of railroad and the transmission lines, has been awarded to the Ambursen Hydraulic Construction Co., Boston, Mass.

STREET LIGHTING.

Spring Valley, N. Y.—An electric light plant is contemplated.

Mancelona, Mich.—The electric light plant has been destroyed by fire.

Cartersville, Ga.—Surveys are being made for the proposed electric light plant.

Durant, Miss.—This city may issue bonds for erecting an electric light plant.

Sabula, Ia.—The establishment of a municipal electric light plant is contemplated.

Spencer, N. C.—This city voted to issue bonds for constructing an electric light plant.

Dothan, Ala.—The improvement of the electric light and water works plant is contemplated.

Thomasville, Ga.—The construction of an electric light plant is proposed. M. R. Mallett, chmn. comn.

Camilla, Ga.—This city will vote on the issue of bonds for constructing an electric light plant.

Ashland, Ore.—This city voted, July 11, to issue bonds to build a municipal electric light plant.

Russell, Ky.—E. E. Fullerton and Hubert Willis, of Greenup, Ky., will erect a lighting system here.

Jackson, Mo.—This city voted to issue $27,000 for constructing an electric light and water works plant.

Geneva, Ind.—Some of the business men of this place are talking of establishing a private electric light plant.

Provo, Utah—This city voted, July 11, to issue bonds for the construction of a municipal electric light plant.

Fort Wayne, Ind.—Sealed bids are asked until Aug. 24 for installing a gas plant here. H. W. Becker, clk. B. P. W.

Bird Island, Minn.—Sealed bids are asked until 7 p. m. Aug. 5 for constructing a gas lighting plant. J. H. Feeter, vil. rec.

Girardsville, Pa.—Bids are asked until Aug. 7 for lighting the streets with about 25 lights for 5 to 10 years. Robt. Pryce, clk. town coun.

Campbellsville, Ky.—Bids will be received about Aug. 15 for constructing an electric light plant. J. L. Atkinson, pres. Campbellsville Lighting Co.

North Tonawanda, N. Y.—A contract has been awarded the Tonawanda Power Co. to furnish this city with 198 arc lamps, at $70 per lamp per year, for two years.

Ann Arbor, Mich.—A 5 year contract was awarded the Washtenaw Light & Power Co., July 17, for lighting the streets, at $63 each for 150 lights, making a total of $47,250.

Peru, Ind.—This city contemplates the reconstruction of its electric light plant, and desires some one to complete the project, both financially and mechanically.

Indianapolis, Ind.—Sealed bids are asked until 10 a. m. Aug. 2 for the construction and operation of a fuel gas plant and distributing system. M. A. Downing, chmn. B. P. W.

Omaha, Neb.—Bids are asked until Aug. 5 for constructing a power house at Battle Mountain Sanitarium, National Home D. V. S., at Hot Springs, S. D. Moses Harris, 346 Bdwy., N. Y. city, gen'l treas. Nat'l Home D. V. S.

Hope, Ind.—Special.—The Ryan Construction Co., of Indianapolis, has just completed for George S. Cook, of this place, a direct current, 220 volts electric light plant, of 75 k. w. capacity, for furnishing electricity for street lighting and commercial purposes.

Indianapolis, Ind.—Council failed to ratify, July 17, the contract entered into

between the bd. of pub. wks. and the Cleveland Street Lighting Co., because it is claimed that the company is infringing on the patents of the Pennsylvania Globe Gas Light Co. Although the city is protected by a $10,000 bond and the contract and bond is approved by the city attorney, the council ordered the contract returned to the bd. of pub. wks., who have again referred it to the council for further consideration.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Grand Rapids, Mich.—The question of installing a garbage crematory will be considered in August.

Philadelphia, Pa.—The contract for collection and disposal of city garbage was awarded, July 13, to the Penn Reduction Co., for $399,575.

Indianapolis, Ind.—Sealed bids are asked until 10 a. m. Aug. 21 for the collection and disposal of garbage and ashes for a period of 10 years. The work will be let in separate contracts. The contract includes the collection of garbage and dead animals and their destruction by chemical treatment and evaporation or cremation by a process to be approved by the board of public health and charities. Ashes are to be collected and disposed of as the contractor sees fit, provided the city does not want to require their use for filling in public improvements. The city has an area of 31 square miles, and an estimated population of 215,000. M. A. Downing, chmn. B. P. W.

PARKS.

Streator, Ill.—The mayor has appointed a park commission composed of Dr. C. R. Taylor, prest.; Mrs. Schurtz, sec'y; Richard Purcell, Louis Nater and Mrs. Jay Baker.

Columbus, Ohio—The park and boulevard com. has announced that it will ask council for $5,000 to complete engineering and other work it has in view. A. J. Pray, sec'y comn.

FIRE APPARATUS.

Rhinelander, Wis.—The purchase of 1,000 ft. of hose is contemplated by the com. on fire dept.

Kenmare, N. D.—The contract for furnishing 1,500 ft. of fire hose was awarded to the W. S. Nott Co., of Minneapolis.

Brazil, Ind.—Special.—Lewis McNutt advises us that this city contemplates the purchase of 500 ft. of hose. Edward Hudson, chmn. fire dept.

TOO LATE FOR CLASSIFICATION

Topeka, Kas.—A petition will be circulated asking that a new sewer be built in the 4th ward.

Wilson, Tenn.—This town contemplates the installation of an electric light and water-works plant.

Fayette, Mo.—The city voted, July 18, to issue $40,000 bonds for constructing a water-works system.

Meridian, Miss.—The contract for street paving was awarded, July 18, to the Jefferson Brick Co., of Birmingham, Ala., for $37,758.33.

Nashville, Tenn.—The question of issuing bonds for the improvement of the suburban streets was voted on July 20. The result is not yet known.

Tamaqua, Pa.—The water supply in Owl Creek has become so low that the borough officials have decided to erect a pumping station near here to supply the town.

Indianapolis, Ind.—Sealed bids are asked until Aug. 5 for constructing a large number of bridges and culverts in Marion county. John McGregor, chmn. co. comrs.

Camden, N. J.—The contract for street lamps was awarded, July 18, to the International Light, Heat and Power Co., at $23.50 for 65 c. p. and $818 for 450 c. p. lamps.

Allentown, Pa.—The contracts for paving Liberty, Jefferson and Madison sts. was awarded, July 18, to the Barber Asphalt paving Co., at $1.78 a sq. yd. for asphalt.

Springfield, O.—The board of public service has directed that bids be asked for building a steel bridge with cement or stone substructure over Buck Creek at Water st.

Salt Lake City, Utah.—An ordinance has been passed creating a new paving district to be known as district No. 21 and providing for the paving of the streets therein. Cy engr. Riter.

Cincinnati, O.—Sealed bids are asked until Aug. 3 for artificial stone work on McKinley Place, bounded by John, Cutter and Wade sts. and Bauer ave. Geo. F. Holes, clk. B. P. S.

North Manchester, Ind.—A franchise for establishing a system for the transmission of electric light, heat and power has been granted to Dr. D. Ginther and associates.

Nashville, Tenn.—The bridge committee appointed by the quarterly county court recently will visit a number of sites preliminary to deciding upon the Cumberland river bridge.

Pittsburg, Pa.—Bids are asked until 10 a. m., Aug. 1, for constructing walls and walks on Washington Square and improving the west side of Schenley Park, near Murdock entrance. Wm. B. Hays, mayor.

Syracuse, N. Y.—Objections will be heard Aug. 7 on the ordinances for paving Highland st. with asphalt and McLellan and Park aves. with asphalt or vitrified brick or block. Geo. J. Metz, cy. clk.

Connellsville, Pa.—Property has been purchased and a large viaduct will be built connecting the Hogg land with Greater Connellsville and a new addition laid out. Co. surv. Jas. B. Hogg, Uniontown.

St. Paul, Minn.—Bids were received July 20 for paving Maria ave. from 7th to Plum sts. with asphalt, vitrified brick, sandstone, creosoted wooden blocks, sand-lime brick and granite. The bids were taken under advisement.

New Castle, Ind.—City council decided, July 18, to construct a large reservoir for the city water station.

Shreveport, La.—Sealed bids are asked until Aug. 8 for paving 2574 sq. yds. of Strand st. with brick. C. G. Rives, compt.

Buffalo, N. Y.—Special.—Council has disapproved the action of the aldermen in awarding the contract for a new 25,000,000-gallon electrical pump at the water-works to the Allis-Chalmers Co., of Milwaukee, for $26,600, and has ordered additional bids on new specifications. The contract for repairing the intake pier was awarded to the Buffalo Dredging Co., for $34,940.

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